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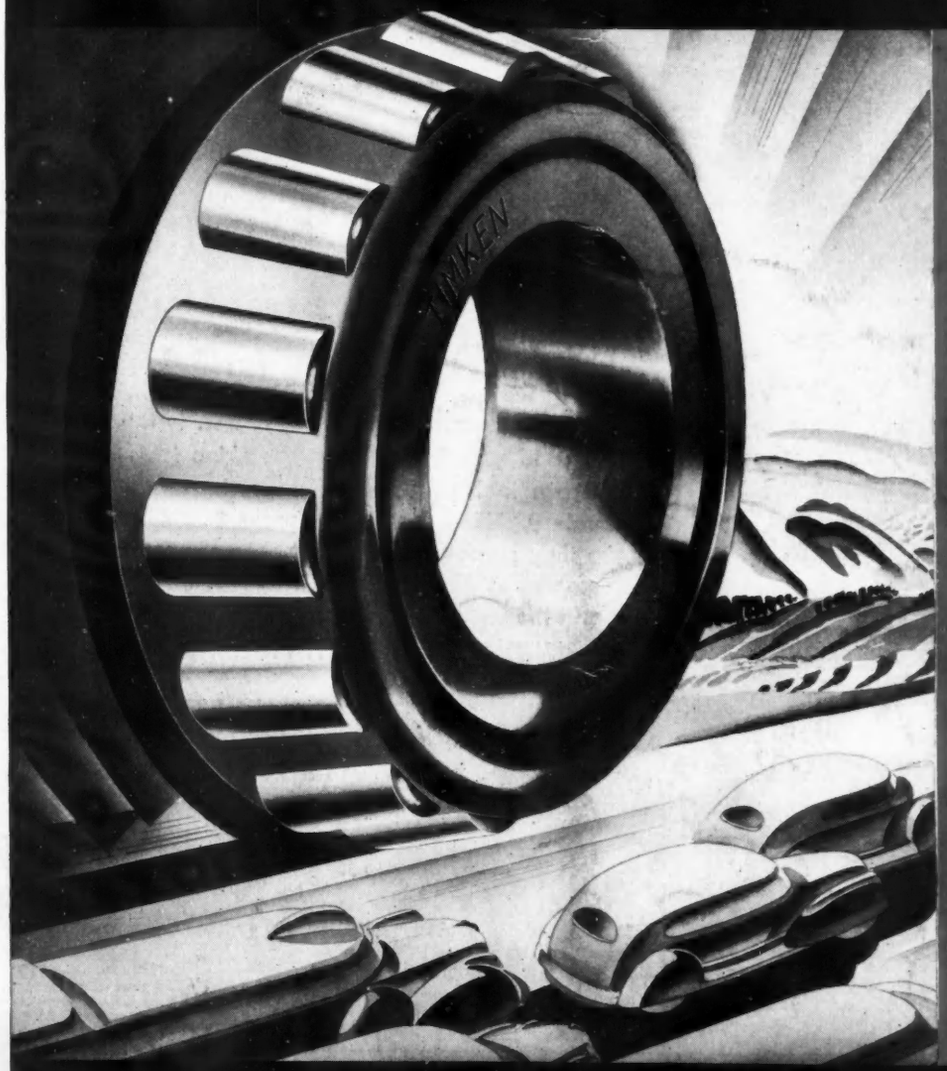
AUTOMOTIVE INDUSTRIES

LAND — AIR — WATER

JANUARY 26, 1935

ROLLING INTO THE 38TH YEAR OF DEPENDABLE SERVICE



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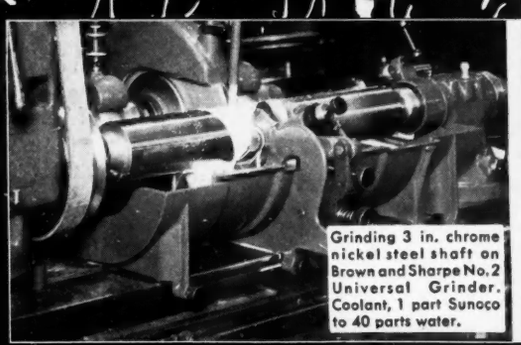
SUN OIL COMPANY, Philadelphia, Pa.

Photos courtesy Buck & Hickman, Ltd., London, England.



Grinding 3 in. chrome nickel steel shaft on Brown and Sharpe No. 2 Universal Grinder. Coolant, 1 part Sunoco to 40 parts water.

Turning 9 in. chrome nickel crown gear on Bullard Single Spindle Automatic. Lubricant, 1 part Sunoco to 20 parts water.

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Reg. U. S. Pat. Off

Volume 72 Number 4

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NRA CODE GRAPHIC ARTS INDUSTRY 1934

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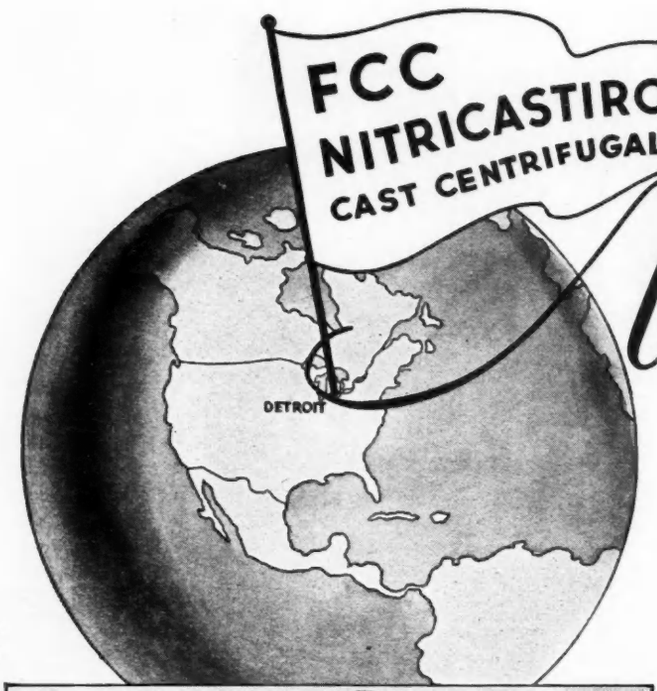

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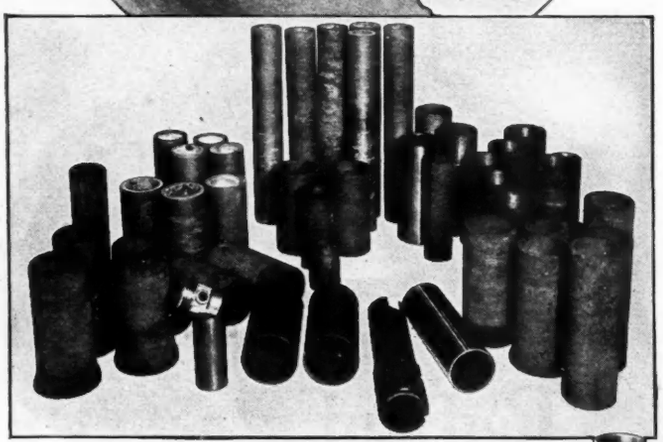
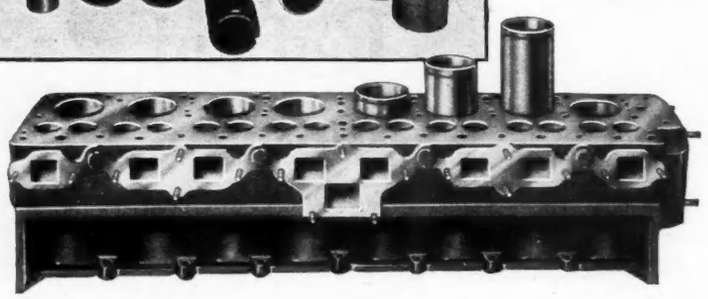


(above)
A group of rough and finished nitricastiron sleeves designed for various purposes.

(at right)
Showing how nitricastiron sleeves are inserted in a motor block.



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AUTOMOTIVE INDUSTRIES

Vol. 72, No. 4 ▫ THIRTY-SEVENTH YEAR ▫ January 26, 1935

Plan 350,000 in February

NIRB Gets Report on Automotive Employment

WASHINGTON, Jan. 24—The report of the NRA Planning and Research Division on automotive employment conditions, based on a study made at the direction of the President, has been presented to the National Industrial Recovery Board. After consideration of its contents, the board is expected to make recommendations to the President.

The NRA Labor Advisory Board is scheduled to meet this evening, when it is understood that William Green will report on the renewal of the automobile manufacturing code.

Few Retail Automotive Outlets Fail Says NICB

Automotive concerns are among those retail outlets showing the greatest resistance to failure, according to a report recently released by the National Industrial Conference Board. Based on 1929 figures for total number of outlets the Board's report shows that in 1931 there were 479 failures of retail automotive concerns out of 45,301 outlets. This is an average of 11 concerns per thousand. This compares with 14 failures per thousand for all retail outlets.

First Two Mos. Output May Top '34 First Quarter Total

by Athel F. Denham
Detroit Editor, Automotive Industries

The continuing flood of dealer orders and the efforts of various car producers to step up schedules forecasts the possibility of January's total vehicle production in the United States and Canada reaching the 300,000 mark.

In view of these encouraging conditions, February's total should reach well over 350,000 units, providing manufacturers are able to gain their tentative objectives and dealer demand continues. Barring labor troubles, an unlikely possibility within the next four to six weeks, it is already a foregone conclusion that the combined January and February totals will exceed the output figure for the entire first quarter of last year, when some 600,000 units were built and shipped. Inasmuch as the first quarter of last year represented almost a 100 per cent increase over the corresponding period of 1933, the estimate for 1935 is even more remarkable in its indications of tremendous acceleration of car sales and growth of dealer confidence.

Individual company reports include a schedule of 130,000 for Ford for February, compared with 100,000 to 110,000 for January, the biggest month for Ford since June, 1930. Incidentally, Ford will be resuming assembly operations at its Cincinnati branch March 1, with a schedule of 150 cars per

(*Turn to page* 105, *please*)

Fenn Succeeds Cole As Hupp Sales Mgr.

William J. McAneeny, president of the Hupp Motor Car Corp., has announced the appointment of Francis H. Fenn as general sales manager, succeeding Rufus S. Cole. Mr. Fenn assumed his new duties Tuesday, Jan. 22.

Mr. Fenn comes to Hupmobile from the staff of Sanderson and Porter, consulting industrial engineers, with whom he has been a merchandising consultant. Previously he was with the Kelvinator Corp., which he joined in 1924 as sales promotion manager, later becoming assistant sales manager. Desiring to broaden his sales experience, Mr. Fenn resigned from Kelvinator to take charge of distribution of that company's product in the Syracuse territory. His merchandising success, plus experience along factory management, engineering, sales promotion and distribution lines, brought him the invitation to join the Sanderson and Porter organization.

During the war Mr. Fenn, who is 36 years old, served with the Fifth Submarine Division of the United States Navy. For five years following the war he was in the custom body and oil refining business.

Mr. Cole would make no statement at this time concerning his future plans.

Strike Talk, Motor-Steel-Textile Union Combined Heard as AFL Plans Big Rally

DETROIT, Jan. 24—Predictions of widespread strikes throughout the country by local American Federation of Labor leaders and the announcement that they would stage a monster automotive workers' mass meeting here on Feb. 23, featured the week's developments on the labor front.

According to plans announced by F. J. Dillon, Detroit organizer, the mass meeting program will be broadcast over an NBC hook-up. From the Washington headquarters of the Federation it is learned that William Green, president, has planned tentatively to attend this meeting, and it is considered likely that he will take a leading part in the program.

(The program department of NBC in New York informed *Automotive Industries* today that no arrangements had yet been made for an AFL broadcast.)

The plan also envisions holding similar meetings simultaneously in other parts of the country not only for automotive employees but for workers in other industries which the federation is attempting to organize. At these meetings it is understood the Detroit broadcast will be picked and reproduced.

The threat of widespread strikes and the plans for simultaneous meetings ties in with reports from Washington that the officers of the textile union had been instructed to work for an alliance of textile, oil, tobacco, steel and automotive unions to enforce Section 7a as interpreted by statutory labor

(*Turn to page* 105, *please*)

Diesels and 2-Cycle Engines Gaining in Marine Field, Motor Boat Show Reveals

by P. M. Heldt
Engineering Editor, Automotive Industries

For some years past the Diesel engine has been in the ascendancy at the motor boat show in New York and this year it is overshadowing the gasoline engine in that most of the largest engines are of the Diesel type. The following makes of Diesel engines are being exhibited at the show: Atlas Imperial, Bolinders, Buda-Lanova, Buda-M.A.N., Cooper-Bessemer, Cummins, Fairbanks-Morse, Hercules (Kermath), Hill, National Superior, Otto, Speedway, Sterling Crankless, and Winton. The Red Wing Motor Company is again showing the Waukesha Hesselman engine in a marine adaptation, which, while not a Diesel engine, burns the same kind of fuel.

The Buda Company, which already had a license under M. A. N. patents, has acquired in addition a license under the Lanova patents and is exhibiting an engine built on the Lanova principle. In this engine some of the air is stored in a separate chamber in the head, from which it escapes as the piston proceeds on its downward stroke, the fuel nozzle being so located in the head that the jet of fuel from the nozzle and the current of air escaping from the air chamber are directly opposed to each other.

An increased number of two-cycle engines are being shown, some or all of the Diesel engines of the following makes operating on the two-stroke principle: Bolinders, Fairbanks-Morse, Sterling and Winton. The Sterling Crankless, built under Michell patents, which was one of the features of last year's show, was exhibited again this year with a number of improvements. The cylinders are now individually cast, for convenience in service, and a new manifold has been designed for the engine. Most of the two-stroke engines have scavenging pumps of the Roots blower type, while the Sterling engine has a piston-type scavenging pump.

Most of the well-known manufacturers of marine gasoline engines are represented, including Chrysler Motors, Hall-Scott, Lycoming, Gifford-Wood, Kermath, Scripps, Palmer and Gray. Outboard motors are being shown by four firms, viz., Johnson, Outboard Motors, Muncie and Champion.

Notable among the engine parts exhibits are the fuel-injection equipment exhibits of United American Bosch Corporation and Ex-Cell-O Aircraft & Tool Corporation. A special exhibit of its marine carburetors is being made by the Bendix Products Corp. The Bendix-Stromberg marine carburetor is shown in cast iron, brass, bronze and die-cast models.

It appears that quite a business is being developed in marine conversions of the Ford V-eight engine, such conversions being shown by several firms, including Scripps, Lehman and Palmer. The Gifford-Wood Company is developing a special stern drive for Ford conversions.

The attendance was very good during the first half of the show and a spirit of optimism prevailed. As usual, numerous meetings of both trade and users organizations were held during show week.

Fred O. Paige

Fred O. Paige, founder of the Paige-Detroit Motor Car Co., died Sunday in Hollywood, Calif. He was 72 years old. Mr. Paige organized the automobile company which bore his name in 1909, becoming the company's first president, but remaining only one year. He was succeeded by the late Harry Jewett. The present Graham-Paige Motors Corp. is the successor to the Paige organization. Mr. Paige is survived by his widow, three sons, a daughter and one sister.

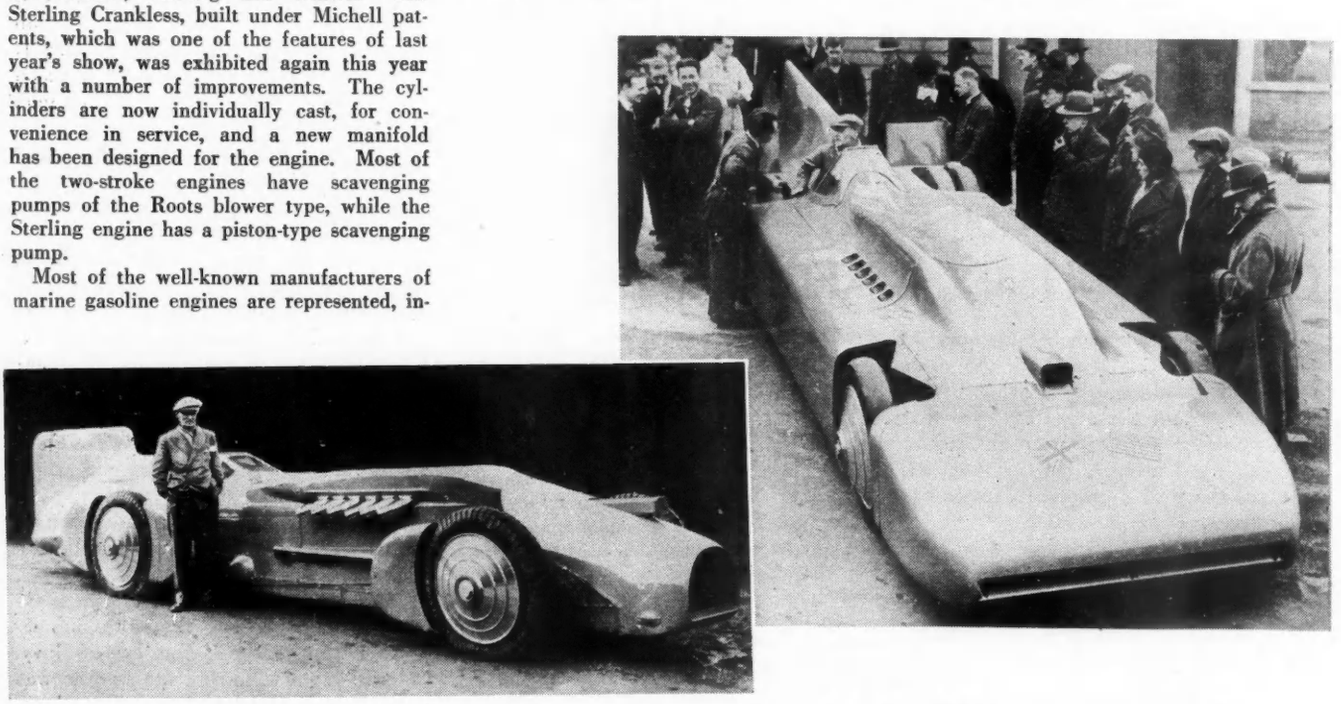
Beisel, MacClain, Thomas Win Manly, Wright Awards

Both the Manly and Wright medals for the outstanding aircraft papers of the year were awarded to R. B. Beisel, Chance Vought Aircraft Co., A. L. MacClain, Pratt & Whitney Aircraft Co., and F. N. Thomas for their papers on the Cowling and Cooling of Radial Aircraft Engines. The medals were presented at the banquet staged by the Detroit SAE section in connection with the Annual Meeting, the Manly medal by Arthur Nutt and the Wright award by William B. Stout.

Caution Plates on Trucks Urged by AMA Committee

The Motor Truck Committee of the Automobile Manufacturers Association, has recommended that truck manufacturers install a caution plate in all motor trucks warning drivers of the need for care and courtesy on the road. The committee suggests that manufacturers place the caution plate in a conspicuous place on the dash.

The suggested wording for the caution plate is—"Warning. Observe all traffic regulations. Drive well on your side of the road. Avoid danger. Be courteous to other highway users."



Sir Malcolm Campbell's new "Bluebird" with which he will try to better his previous speed mark of 272 m.p.h. made with his first "Bluebird" (at lower left) at Daytona Beach, Fla., in 1933. The new car (upper right) is more completely streamlined than his 1933 racer and has dual rear wheels

Dineen Succeeds Lewis As GM Advertising Chief

Appointment of J. W. Dineen as director of the advertising section of General Motors Corp. has been announced by R. H. Grant, vice-president in charge of sales.

Mr. Dineen succeeds W. W. Lewis, who resigned to become vice-president and general manager of Campbell-Ewald Co. He retains the title of director of sales and service section for General Motors Corp.

John W. Loranger

John W. Loranger, former general sales manager of the Packard Motor Car Co., died last week in Pasadena, Calif. He was 41 years old. Mr. Loranger joined the Packard company in 1919, being assigned to the auditing department and in 1926 was made a sales executive. In 1930 he was named general sales manager but was forced to resign in 1933 because of illness. Mr. Loranger is survived by his widow, Princess, and two sons, John and Robert.

John W. Loranger

Knudsen Calls Workmen Fair and Well Informed

American workmen are seldom unfair in their demands and usually have an intelligent understanding of the conditions of the business of which they are a part, W. S. Knudsen, executive vice-president of General Motors, told 200 industrial executives, meeting last week in the Western Y. M. C. A., Detroit.

"One of the best results of the Act (NIRA) is that it brought us closer to the workmen than we managers have been for a long time," Mr. Knudsen said. "In my 35 years in American industry I observed a revolution. It was a peaceful revolution. It improved industry's productive ability, but it wiped out the intimate relationship that once existed between the foreman and his men. That was an unhealthy condition that is now being corrected. . . . Anyone who has dealt with the American workman knows that the root of industrial relationship is to know what you're talking about before you do anything that affects the workmen, for most of the men in the shop will be found to be intelligently informed about the conditions of the business of which they are a part."

Mr. Knudsen said that in his own experience in employer-employee conferences he found that employees were seldom unfair in their demands, that the snags were encountered when it was necessary to deal with men who had no regard for the interests of the company.

Open Price Filing Asked In Leaf Spring Code

An amendment establishing open price filing in the leaf spring manufacturing code, an APEM supplement, has been proposed. Suggestions or objections to the amendment must be filed with Jo G. Roberts, NRA Deputy Administrator, before Feb. 9.

Charles W. Crick

Three AC Promotions

Charles W. Crick, Miles Hanson and Kennett Wilcox have been promoted by the AC Spark Plug Co., according to Fred S. Kimmerling, president and general manager. Mr. Crick becomes assistant to the president; Mr. Hanson was made a superintendent with jurisdiction over the instrument department, and Mr. Wilcox, formerly assistant to Mr. Crick when the latter was office manager of the equipment sales department, assumes the managership of this division.

Greater Production as Employment Aid NIRB Aim; Announce Labor Hearing Rules

An increased volume of production is now the most important means of securing reemployment, the National Industrial Recovery Board said last week in announcing the ground rules for the public hearing it will open on Jan. 30 on code employment provisions. The rules indicate that the hearing will cover substantially all labor regulations in codes except Section 7a.

Among the major questions on which the Board particularly desires information are the following:

HOURS

1. How has limitation of hours affected the volume of employment?
2. How has limitation of hours affected the regularization of employment?
3. How has limitation of hours affected unit cost of production?
4. Should the maximum working week in the codes be reduced, maintained, or increased generally, by groups of industries, or separately by individual industries?
5. Is the degree of flexibility in hours provided by such provisions as overtime, peak periods, averaging, etc., inadequate, adequate, or excessive?
6. Do the present provisions work as well as any method or methods that can be devised?
7. What effect has the limitation of hours had on hourly, weekly and annual earnings?

WAGES

1. What standards should be followed in establishing minimum wages?
2. Are present minimum wages satisfactory from the point of view of such standards?
3. What has been the relation of changes in hourly, weekly, and annual earnings to changes in the cost of living?
4. What has been the effect of differentials such as those based on sex, location, or population?
5. Are provisions such as several basic minimum wages, classified wage scales, equitable adjustment provisions, or other methods of maintaining wages above the minimum, desirable?
6. What is the effect of wage provisions on costs and on volume of consumption?
7. How should piece work rates be adjusted to code rates?

GENERAL PROBLEMS

1. Are wage and hour provisions desirable as temporary or as permanent measures?
2. What effect do standard wage and hour provisions have on establishments varying in size and in degree of mechanization?
3. What should be done to meet the problem of:
   a. Overlapping definitions?
   b. Multiple code coverage?
   c. Competing industries?
4. How effective are wage and hour provisions as measures for eliminating unfair competition?

In announcing the hearing, the Board also summarized its present position on some of the questions at issue. It endorses minimum wage regulation, but believes greater simplicity and uniformity is possible. It believes that the effects of inequities in wages above the minimum should be determined. It desires information on the effects of geographic wage differentials. Maximum hours provisions are held to have contributed to reemployment and the Board feels that they should be continued, perhaps with modifications to make them simpler, more flexible and as uniform as possible.

Those desiring to testify at the hearing should file their requests with the NIRB prior to noon, Jan. 29.

One of 400 2½ ton 4-wheel drive trucks now being built for the U. S. Army by the Federal Motor Truck Co. climbing a 57 per cent grade fully loaded

ALB Absolves Fisher of Seniority Rule Violation

In a group of cases involving charges that the seniority rules of the Automobile Labor Board had been violated by Fisher, Cleveland, the Board has ruled in favor of the company. The cases grew out of the company's rule that an interval of a year or more in employment amounts to a break in service which cancels any seniority rights a former worker may have had.

The cases were brought by the United Automobile Workers Federal Labor Union No. 18,614 on behalf of former Fisher employees. The Board's rulings indicate that in every case there was a period of more than a year during which the complaining worker was not employed by the company, and consequently the Board held that the management did not err in refusing to grant seniority rights.

Although the charges were made by the union, its representatives did not attend the hearings, although representatives of the works council and of the management were present.

Motor Code Renewal Seen Without Change

Employment Report Not Expected to Alter Plan; Labor Opposition Likely

Washington, Jan. 24.—Renewal of the automobile code without change on Feb. 3 is generally expected here despite conflicting reports and in the face of the usual gestures of organized labor. It is distinctly the view at NRA headquarters, nor is the view altered by the statement of Donald Richberg, director of the National Emergency Council, that it was "unfortunate" that the impression has been given out that the code will not be revised.

As in the past when the code was about to be renewed, the American Federation of Labor has insisted that it should not be again extended without meeting labor's demands. On Monday night the Federation issued a statement of protest.

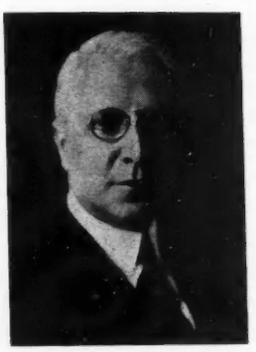
"Labor will protest most vigorously to an extension of the automobile code in its present form," said President William Green of the Federation. "The labor sections of the automobile code have been unsatisfactory from the start."

Notwithstanding this welter of conflicting views, the attitude at NRA is that the date of renewal is too near at hand for any fundamental changes. The study on regularizing of production and employment, expected to be submitted to the Board the latter par tof the present week, it is argued, hardly can be used as a basis for changes at this time. It will have to go to the NIRB first and later to the White House, and the industry must have an opportunity to study the practicability of any proposals it may contain. Moreover, since it is understood that NRA plans to continue its study of automotive employment, it is probable that the report it is expected to make this week will be a tentative one.

There are no indications that hearings will be held on the code prior to its extension, if it is extended, as it is generally believed it will be.

Willys Elected W-O President When Preferred Stockholders Take Control

John N. Willys, founder and leader of the Willys-Overland Co., for many years, was elected president of the company last week when preferred shareholders took over the active control of the corporation.



John N. Willys

The meeting marked a virtual farewell to the old common stock interests, more sharply differentiated the preferred stockholder and creditor interests in the present receivership and reorganization plans.

George W. Ritter, counsel for the preferred stockholders' protective committee, called the meeting to order in the auditorium of the administration building. Only a few shareholders were present, but 70,528 out of the 126,000 shares outstanding were present by proxy.

Directors named include John N. Willys, W. B. Stratton, chairman of the reorganization committee; H. C. Tillotson, president of the Tillotson Manufacturing Co.; Frank Landwehr, secretary of the Electric Auto-Lite Co. and director in several Miniger enterprises, and H. J. Leonard, chairman of the preferred stockholders' protective committee.

Besides Mr. Willys, the directors named Mr. Tillotson, vice-president; Mr. Leonard, treasurer, and Mr. Landwehr, secretary.

Mr. Leonard liquidated the Stearns-Knight Co., in Cleveland, after control of it was purchased by Mr. Willys several years ago.

It was disclosed at the meeting that a considerable amount of Mr. Willys' holdings of preferred stock are in names of Shippee & Rawson, Henry Clews & Co., H. Hentz & Co., brokerage houses, and the Claytona Co., Ltd., a holding company.

David R. Wilson, receiver, now in charge of operations at the plant, was out of the city the day of the meeting.

First of the 450 cars to be produced this week came off the line Monday. Many of the cars included in the first 5,000 already sold have been awaiting only some intricate stampings to be completed. Full production is expected within about two weeks.

Mr. Willys indicated marked enthusiasm for the new 1935 Willys 77, and it is believed the volume of orders coming in has hastened some of the preparations for reorganization.

Maintenance Code OK'd with Stays on Conflicts with Dealer Code Provisions

After being battered from pillar to post for more than a year, the code of fair competition for the motor vehicle maintenance trade, including car dealer service stations, has finally been approved by President Roosevelt. A number of its provisions, however, are stayed indefinitely, while all of its provisions which may conflict with the motor vehicle retailing code are stayed for 60 days for further study to determine which of the provisions of the two codes should govern the maintenance business of both trades.

The code sets a maximum 44-hr. work week of not more than 6 days per week and not more than 8 hrs. per day. Clerical and office employees may work two additional hours in two 24-hr. periods in any 30-day period. Watchmen may work a maximum of 56 hrs. in any 7-day period, but not more than 12 hrs. per day. Productive employees available or on call, when not assigned to specific tasks, are to be paid not less than half time, providing the resultant is not less than 36 cents per hr. Employees engaged in outside selling and those engaged in emergency maintenance or repair work are not subject to the maximum hours limits, but the latter must be paid time and a half for overtime. Owners, managers and executives earning more than $35 per week also are excepted, but must not work more than the prescribed hours when performing other than managerial and executive work. Since these provisions are practically all in conflict with the motor vehicle retail code, they presumably are stayed for 60 days. Minimum wage rates range from $15 per week in cities of more than 500,000 down to $13 in towns of less than 2500.

The President's order stays the provision covering emergencies resulting from destructive price cutting. It also stays a provision intended to prevent reductions in price on a repair job once a shop had made a bid on the work. Another stayed provision permitted all members of the industry to vote in the first election of the National Code Authority.

The code is said to apply to approximately 100,000 shops employing about 350,000 workers, but apparently does not apply to about 85,000 other establishments in which automotive service is a supplemental part of their principal business. The total volume of maintenance business is estimated at $2,500,000,000 annually, of which $1,775,000,000 is said to go to the shops covered by the code just approved.

Administration of the new code is expected to present some real problems if for no other reason than the fact that the trade includes so many small units which will be difficult to organize. There are said to be 1305 active and non-active maintenance associations in the trade, and NRA feels that the code will provide a nucleus around which a strong national association can be built. However, it is felt in some quarters that effective administration of the trade practice provisions by the trade itself will prove impractical and that any enforcement will depend on NRA. In that case it is held NRA probably will concern itself with the labor provisions, which alone present a tremendously difficult administrative job.

Chrysler Workers Rebuff Organizations in Voting

Nominating elections held by the ALB at the Chrysler Highland Park plant duplicated closely the results of previous elections at other automobile plants with 3864 workers designating no affiliation out of 4010 ballots cast and 4450 working at the time. Votes polled by outside unions totaled 75 of which the AFL had 38. No votes were cast for the works council.

At the Plymouth plant, 9296 workers voted in the nominating elections out of a total of 10,086 who were eligible, and of 9794 who were employed when the election was held. Of the total vote, 8398 showed no affiliation, 343 voted for the AFL, 11 for the MESA, 257 for the Associated Automobile Workers of America, 3 for the Auto Workers Union, and 2 for the Plymouth Employees Association. Blank ballots cast numbered 104, while 178 were voided.

Frank X. Martel, federation executive in Detroit, was nominated in one district but declined. The only other nominee, not a worker, was Howell VanAuken, a Detroit attorney, who has accepted the nomination.

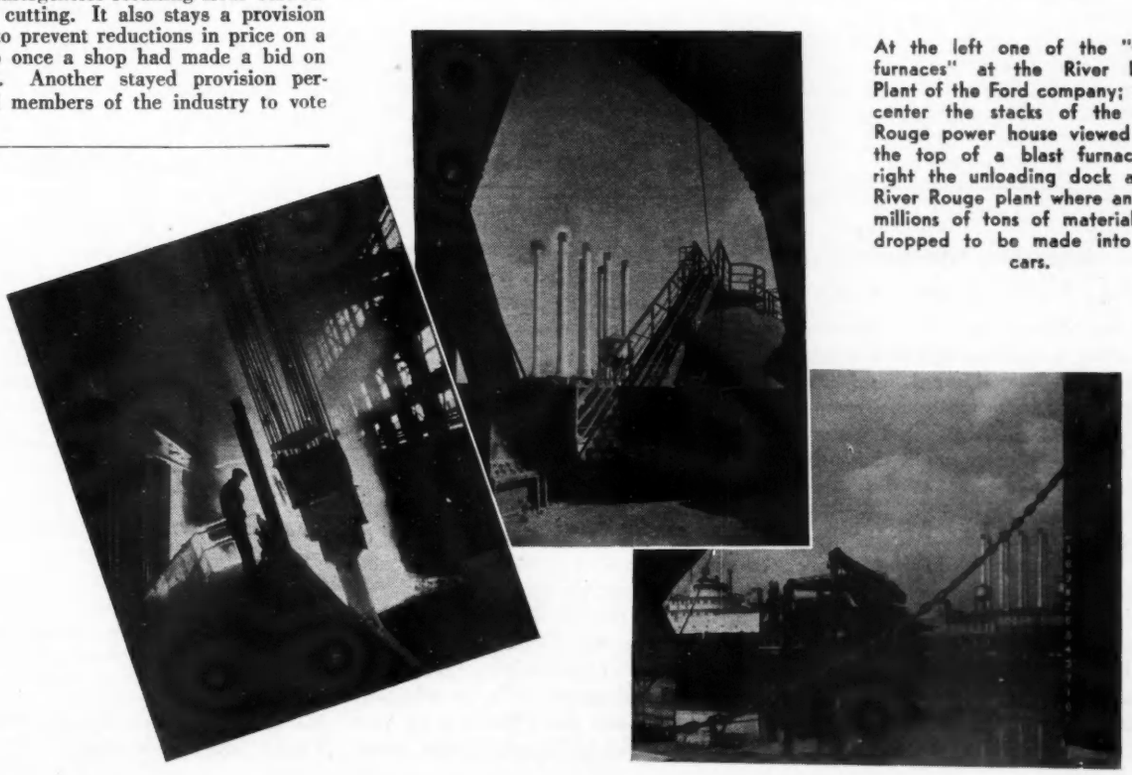
Preliminary returns on the nominating elections at the Dodge plant show that 18,428 votes were cast, of which 16,947 show no organization affiliation. The AFL was designated by 997, the MESA by 73, the employees' association by 11, the Auto Workers' Union by 7, the Associated Automobile Workers by 7 and the IWW by 7. There were 146 blank and 337 void ballots.

L. V. Newton Now a Kentucky Colonel

L. V. Newton, Byllesby Engineering and Management Corp. and vice-president of the SAE Transportation and Maintenance Activity, has been commissioned a colonel on the staff of Ruby Lafoon, Governor of Kentucky.

Frank Frisz

Frank Frisz, mechanical engineer, A. O. Smith Corp., Milwaukee, in charge of the estimating department, died Jan. 18. He was 53 years old. Mr. Frisz, a graduate of Rose Polytechnic Institute, Terre Haute, Ind., joined the Smith company in 1920.



At the left one of the "tilting furnaces" at the River Rouge Plant of the Ford company; in the center the stacks of the River Rouge power house viewed from the top of a blast furnace; at right the unloading dock at the River Rouge plant where annually millions of tons of materials are dropped to be made into Ford cars.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

There was no decline in the rate of betterment in general business last week. Thus far during 1935 the improvement in trade has been much better than in comparable periods as far back as 1930. The fear of an adverse ruling on the gold clause by the United States Supreme Court spread some hesitancy in financial markets, but it had no apparent effect on commercial transactions. The major industries made the best showing in several months, with the most pronounced improvement in steel and electrical energy production.

Car Loadings Up 55,602

Railway freight loadings during the week ended Jan. 12 totaled 553,675 cars, which marks an increase of 55,602 cars above those during the preceding week, a decline of 3591 cars below those during the corresponding period last year, and an increase of 47,782 cars above those in the corresponding period of 1933.

Current Output Rises 7.7%

Production of electricity by the electric light and power industry in the United States during the week ended Jan. 12 was 7.7 per cent above that in the corresponding period last year. Production during the preceding week was 6.7 per cent above that in the corresponding period of 1934.

Building Contracts Drop

Construction contracts awarded in 37 eastern states during December, according to the F. W. Dodge Corporation, amounted to $92,723,700, which is the lowest total for any month since July, 1933. The current figure was 17 per cent below that for November and 55 per cent below that a year ago. Contracts awarded during the entire year 1934 amounted to $1,543,101,300, which marks an increase of 23 per cent above those in 1933.

Cotton Consumption Off

Cotton consumed in the United States during December amounted to 465,601 bales, including linters, as compared with 528,451 bales during the preceding month and 398,094 bales during the corresponding period last year.

Crude Production Up

Average daily crude oil production for the week ended Jan. 12 amounted to 2,538,500 barrels, as against 2,388,600 barrels for the preceding week and 2,311,250 barrels for the corresponding period last year. The current figure exceeded the Federal allowable quota by 78,200 barrels.

Fisher's Index

Professor Fisher's index of wholesale commodity prices for the week ended Jan. 19 showed an increase for the fourth successive week. The current index stands at 81.1, as against 80.7 the week before and 79.4 two weeks before.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended Jan. 16 showed an increase of $10,000,000 in holdings of discounted bills. Holdings of bills bought in the open market and of government securities remained unchanged.

Ford Cincinnati, Memphis Branches to be Reopened

The Ford Motor Co. has announced that assembly operations will be resumed shortly at both the Memphis and Cincinnati branches. The Cincinnati branch will be reopened about March 1, but no definite date has been announced for the resumption of operations at the Memphis plant, which since 1932 has been operating solely as a sales branch. Last week it was announced in *Automotive Industries* the St. Paul branch would be reopened for assembly operations.

Production plans for the Cincinnati plant call for 150 cars daily for the first few weeks with reemployment of between 300 and 400 former Ford men to conduct the operations. While no production schedule has been announced for the Memphis plant it is understood that about 1800 men will be employed when the plant begins operations.

Lewis Leaves GM to Join Campbell-Ewald as V. P.

H. T. Ewald, president of the Campbell-Ewald Co., has announced the appointment of W. W. Lewis, formerly director of the advertising section of General Motors, as vice-president and general manager of the company.

Mr. Lewis for the last 12 years has been connected with General Motors and General Motors car divisions. He joined the Cadillac Motor Car Co. as advertising manager and three years later was appointed assistant general sales manager and director of advertising. He left Cadillac to become assistant director of the advertising section of General Motors, later becoming director of the advertising section. He resigned this position to become vice-president and general manager of Campbell-Ewald Co. with headquarters in Detroit.

Steel Specifications Are Revised by S.A.E.

Revisions in SAE steel specifications affecting analysis, heat treatments and physical property curves, have been approved by the Standards Committee and will be published in the near future. A new automotive cast iron standard has been added. Screw thread standards also have been revised, 8, 12 and 16 series of pitches now being included.

The Committee also adopted a revised specification for motor boat propeller-shaft ends and propeller hubs, and set a standard for boat transoms for mounting outboard motors.

The lubrication division of the committee has developed a standard form for the use of car makers in supplying lubrication specifications on new models.

During the past year, the Automobile Manufacturers Association contributed $7,500 to the standards work of the SAE.

New Directorate Elects Sternberg Sterling Head

E. M. Sternberg has resumed the presidency of the Sterling Motor Truck Co., Milwaukee, by election by a new board of directors. William G. Sternberg and H. C. Keenan were elected vice-presidents, and Oscar E. Held, secretary and treasurer. This completes a reorganization which has been under way for the past year.

For the fiscal year ended Oct. 31, the Sterling company reported a loss of $42,283, compared with a deficit of $175,000 in the previous year. Current assets were $945,000 and current liabilities, $393,000. Cash was $75,300 with receivables being liquidated rapidly. There is no bank indebtedness. Reserves, it was stated, are more than $160,000. Business is reported improving and employment is twice that of a year ago, with about 125 at work.

Murray Body Union Joins Wayne Co. Federation

The Murray Body Corp. Federal Local of the United Automobile Workers voted unanimously at a meeting held last Wednesday for affiliation with the Detroit and Wayne County Federation of Labor, according to a recent report.

Prior to that, Kelsey-Hayes local union also voted to affiliate with the Detroit and Wayne County Federation.

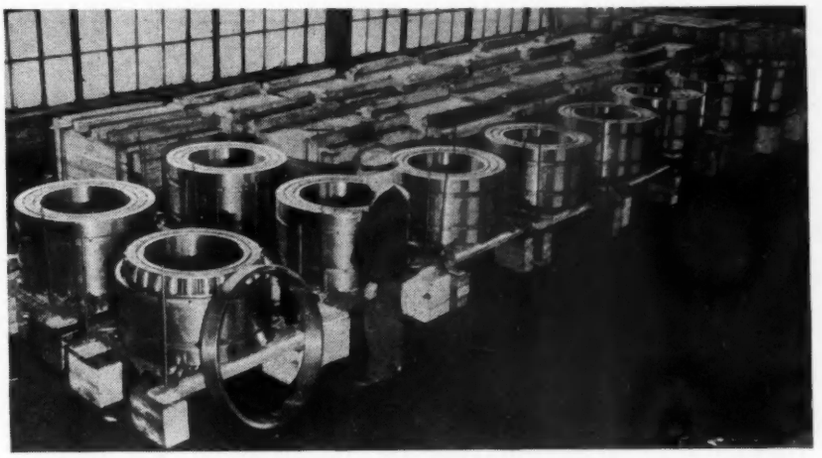
Motor Jobs Continue To Boost Steel Output

Present Demand Brings Level to Satisfactory Point for Normal Years

Automotive demand enabled steel mills, especially those in the Detroit and Youngstown districts, to further step-up their operating rates this week. Cleveland district mills continue to operate for the most part at virtually capacity. Steel demand has reached a level that in other than war or extraordinary boom years has been considered as quite satisfactory.

The American Iron and Steel Institute has come out in defense of its method of computing weekly rate of operations on the basis of ingot capacity. A Chicago banker had rushed into print with the statement that 15 per cent of this capacity was obsolete and that the Institute's figures were that much out of the way. The Institute has set forth in a statement that in its weekly computations not only has all capacity that is no longer capable of producing steel ingots been excluded, but that an allowance of 12½ per cent is made for idle time due to the necessity of furnace repairs and other emergencies.

This week the Institute reports 49.5 per cent of the industry's ingot capacity operating. In view of the fact, according to the Institute's own statement, that several important producers are operating at 100 per cent of their ingot capacity, the weekly average rate, standing by itself, while statistically correct, falls short of furnishing a true picture of the industry's state. This could hardly be otherwise when there is so sharp a divergency as prevails between the order books of different districts and individual mills. Cleveland and Detroit producers are operating at more than twice the rate of Pittsburgh mills. Whether the peak of the buying movement has or has not been reached, depends not only upon how long motor car manufacturers and parts makers will continue to call for steel at the present rate, but also upon the extent steel commitments from other consuming industries will come out over the next few weeks. Certain it is that in flat steels, sheets and strip, buying for the time being is so overwhelmingly of an automotive character that the aggregate of takings for other purposes is of negligible importance. Sales by members of the National Association of Flat Rolled Steel Manufacturers in December reached nearly 200,000 tons or 60 per cent of their rolling capacity.



Ford Steel Mill Bearings

These 23 of the 1400 Timken Tapered Roller Bearings are for the new Ford steel mill. Fifty-two bearings of the size illustrated (25½ in. x 40½ in.), each weighing 4086 lb. will be installed. In all 185 tons of Timken Bearings will be used in the new mill which is being built by the United Engineering & Foundry Co.

Pig Iron—Lake furnaces are shipping more iron to automotive foundries, all of it for early melts, the stabilized condition of the market having eliminated the necessity of forward covering for the present.

Aluminum—Prices for secondary aluminum are again on the uptrend, producers having had to pay higher prices in recent scrap purchases. The market for virgin metal is unchanged.

Copper—With the expected arrival here this week of Ferdinand Pisart, managing director of the Union Miniere du Haut Katanga, the world's largest copper producer, there is again talk of the possibility of an international agreement on production and sales being reached in the near future. Prices continue unchanged.

Tin—Spot stock of Straits tin are so light that those who must have tin at once are offering ⅛ @ ¼ cent per pound premium over the nominal 51 cent level at which Straits was quoted at the beginning of the week.

Lead—Quiet and steady.

Zinc—Dull and unchanged.

ALB Amends Lay-Off and Rehiring Rules

Employees first hired less than one year prior to a decrease of force, in general are to be laid off first and rehired last, according to amended rules governing lay-offs and rehiring issued by the Automobile Labor Board on January 18. A comparison of the new and old rules follows:

NEW

A—Employees who were first hired less than one year prior to a decrease of force shall be the first to be laid off, irrespective of marriage or dependency, unless they fall within class D mentioned below.

B—Employees next to be laid off shall be those who were first hired a year or more before the decrease of force who are unmarried and without dependents, except in the cases of employees of long service and of employees in class D mentioned below.

C—Employees next to be laid off shall be those who were first hired a year or more before the decrease of force who are married and those who have dependents.

OLD

A—Employees hired after Sept. 1, 1933, shall be the first to be laid off, irrespective of marriage or dependency, unless they fall within class D mentioned below.

B—Employees next to be laid off shall be those hired before Sept. 1, 1933, who are unmarried and without dependents, except in cases of employees of long service, and of employees in class D mentioned below.

C—Employees next to be laid off shall be those hired before Sept. 1, 1933, who are married and those who have dependents.

UNCHANGED

In each of classes B and C employees of less service shall be laid off before employees of longer service; service to be determined on a yearly basis.

D—Employees whose work in the judgment of the management is essential to the operation of the plant and production, or who have received special training or have exceptional ability, may be hired, retained or returned to work notwithstanding the provisions of clauses A, B, and C.

Battery Trade Complaint Committee Gets Approval

The trade practice complaint committee of the electric storage and wet primary battery industry has been approved by the NRA. Members of the committee are: E. D. Martin, chairman, Emark Battery division, Thos. A. Edison, Inc.; C. O. Wanvig, Globe-Union Manufacturing Co.; L. B. F. Raycroft, Electric Storage Battery Co.; W. J. Sandman, Advance Battery Co.; D. A. Graham, Red Bar Battery Co.

1934 Production 2,282,637

(U. S. & Canada)

	Passenger Cars	Trucks	Total
Dec., 1934	130,393	55,526	185,919
Nov., 1934	46,547	33,565	80,112
Dec., 1933	52,960	30,867	83,827
12 months 1934	2,282,637	612,992	2,895,629
12 months 1933	1,627,367	358,614	1,985,981
	Per Cent Change		
Dec., '34 over Nov., '34	+179.0	+65.8	+132.0
Dec., '34 over Dec., '33	+146.0	+80.0	+122.0
12 months '34 over '33	+ 40.3	+71.0	+ 45.9

Two Object to Studebaker Reorganization Proposal

SOUTH BEND, Jan. 24—Two petitions objecting to reorganization of the Studebaker corporation are on file with the clerk of the Federal District Court in South Bend. The plan comes up for hearing Friday, Jan. 25, before Federal Judge Thomas W. Slick, who is holding court in Fort Wayne.

Daisy W. Jacobs of Summit County, Ohio, a common stockholder, declares the Rockne Motors Corporation creditors get favored treatment; that creditors should receive some cash and debentures as part payment of claims; that underwriters' compensation is excessive and that common stockholders are entitled to better treatment. She owns 200 shares Studebaker common and $2,500 6 per cent gold notes.

Objections of Margaret Willoughby and George Pyne declare the Studebaker corporation to have been a going and solvent concern before and during the receivership as well as at present, that the plan is not fair, equitable nor feasible and does not comply with the provisions of the corporate reorganization act. They suggest a plan to replace it.

Eastman to Reveal Truck Program Soon

Federal Coordinator of Transportation Eastman is expected to announce his plan for regulating motor trucking in the very near future, the current issue of *Commercial Car Journal* says.

His plan, this magazine says, involves taking over the trucking code, because it is felt that there are certain desirable things not inconsistent with commission regulation, which can be better accomplished under a code. He is said to recognize that the code has been the basis for organization of the industry and that organization will help commission regulation. It is also stated that he believes that the code can prevent exploitation of labor and that, through it, certain fair trade practices can be handled, even self-regulation of rates if commission control is not precluded.

Federal regulation of interstate trucking is understood to be part of his plan. The control would be exercised by an enlarged commission with specialized departments for each type of transportation. The regulatory measure would differ from previous bills, it is reported, in that it would provide varying degrees of regulation for different types of trucking operation. Possibly the regular route common carrier would be the only type under complete commission control. A system of certificates and permits, and the joint board set-up in the Rayburn bill is contemplated.

New NRA Legislation in 2 Weeks, Roosevelt Says

President Roosevelt has announced that he hopes to have specific legislative recommendations for the strengthening of the National Recovery Administration ready in about two weeks for presentation to Congerss. The original plan was to defer NRA legislation until later in the legislative season.

R. P. Smith, factory manager of the Eaton Axle plant who died last week

Name Harper Sales Mgr. of New Truck Company

Harry Harper, for many years connected with the Willys-Overland Co. in a sales capacity, is the new sales manager for the Consolidated Motors Corp., Lima, which has purchased the former plant of the Relay Motors Corp., where a new light truck will be made. Production is scheduled to start next month.

New Small Outboard Motor Rated at 1½ hp.

Outboard Motors Corporation, Milwaukee, has developed a new small outboard marine motor, the Sportman, of 1½ hp. rating at 3500 r.p.m. It weighs only 24½ lbs., has magneto ignition, and is designed to propel small rowboats and fishing boats at speeds of from 5 to 7 m.p.h. It incorporates the aluminum hood for the power head which was featured by the corporation on its other models last year. Features of the outfit are a rubber covered steering handle and means of adjustment for tilt-up and stern angle. The price is $55.00.

Heil Co. Constructing 97 Aluminum Tanks for S.O.

The Heil Co., Milwaukee, has in production an order from the Standard Oil Co. (New Jersey) for 97 aluminum tanks for oil transportation trucks designed by Fred G. Thwaits, chief engineer of the truck body division, and estimated to cost $250,000. The tanks are streamlined, and the truck as a whole will resemble the Chrysler Airflow, which chassis is the basis for the units. The company also is building oil transportation tanks for the Texas Corp., the Pan-American Oil Co., Socony-Vacuum Co., Wadhams Oil Co. and others. The Standard Oil order is said to call for the largest fleet of aluminum tanks ever built in America.

Caterpillar Tractor Co.

In a preliminary statement of 1934 business the Caterpillar Tractor Co. reports a net profit for the year of $3,651,190 compared with $302,716 for 1933. Last year's profit was calculated after interest, expenses, depreciation, provision for federal income taxes and other charges. Current assets, as of Dec. 31, were fixed at $21,630,918, of which $3,241,410 was in cash; current liabilities on the same date were reported at $1,709,897. These totals compare with $23,969,131 and $1,193,724 respectively for 1933. Cash a year ago was reported at $4,629,243.

H. H. Bennett Appointed Prison Commissioner

Harry H. Bennett, service manager of the Ford Motor Co., has been appointed to the State Prison Commission of Michigan by Governor Fitzgerald. Mr. Bennett succeeds B. J. Abbott of Saginaw.

Henderson to Manage Briggs Service Dept.

W. F. B. Henderson, formerly with the body service department of Edward G. Budd Mfg. Co., has been appointed head of service for the Briggs Manufacturing Co. The service department is being moved from the Highland Park plant to the Hamtramck plant.

Ketcham Opens Own Office

Howard Ketcham, for the last eight years prominently identified with color appeal in product design, has opened an office at 545 Fifth Avenue, New York, where he will specialize in commercial phases of color in industry.

As director of the Duco Color Advisory Service of E. I. du Pont de Nemours & Company and editor of the *Automobile Color Index*, Mr. Ketcham has done pioneer work in promoting greater use of the right color in the proper place.

Ryan, Wholesale Code Investigator, Approved

NRA has approved the appointment of Daniel J. Ryan, Washington, D. C., as national investigating agent of the wholesale automotive trade with power to appoint district investigating agents.

Mr. Ryan's duties will embrace the investigation of relevant reports by members of the trade, in accordance with Article VIII, of the wholesale automotive trade code, particularly in regard to reports on volume of sales upon which code budget assessments are made.

AFL Plans Rally

(*Continued from page* 97)

boards. It is understood that the matter will be taken up by the executive council of the federation which meets Jan. 29.

Mr. Dillon, with three members of a committee of the national council of the United Automobile Workers of America, is leaving for Washington Saturday to discuss with the AFL executive council next Tuesday the setting up of an international union of automobile workers and to talk plans for strikes, perhaps toward the end of February, in the automobile, steel and textile industries. While in Washington, Mr. Dillon also will testify at the public hearings the National Industrial Recovery Board is holding on code labor provisions. At these hearings, it is anticipated the AFL's objections to the ALB elections will be reiterated. Incidentally, in this connection, Mr. Dillon charges that workers in plants where elections have been held have been coerced to vote both by the management and the Wolman board, and that affidavits to that effect are being collected by AFL headquarters here.

Another development of the week was a protest to the President by the Associated Automobile Workers of America in a statement issued by Arthur E. Greer, chairman of that organization. He said: "We claim that the American Federation of Labor is not truly representative of the workers in the industry and we object to conferences in relation to the code in which the federation is admitted to the exclusion of other unions."

The possibility of another general workers' organization in the industry was forecast by Elmer H. Gustavson, former chairman of the Cadillac works council and chairman of the recently elected Cadillac employee representation board.

Meanwhile in elections being conducted by the Automobile Labor Board, automobile workers continue to show almost a total lack of interest in organizations. In every election held so far, neither outside unions nor works councils have polled more than an insignificant fraction of the total vote, the worker naming individuals—mostly from their own ranks—to represent them in collective bargaining.

Of course, it might be contended that the returns do not show the real strength of the unions since the AFL announced at the outset that it would not participate. However, if the AFL unions are credited with all the eligible workers who did not vote, the total is still a small minority.

On the basis of the ALB election returns, it would appear that the AFL is creating a lot more noise than the number of automotive workers in its ranks would warrant. However, minorities sometimes are able to exercise an influence that is out of proportion to their numbers, particularly if they are able to marshal their strength in key departments or plants.

Robert E. Lee

Robert E. Lee, for many years prominently identified with the development of the automobile business in St. Louis and the surrounding territoy, died Wednesday, Jan. 23, at his Carrswold Drive Home in St. Louis. He had been ill for two and a half years.

"Bob" Lee, in addition to his diversified automotive interests in St. Louis, where he was manager of the dealers' association and the impresario of St. Louis automobile shows, was for many years, and until his death, president of the International Association of Automobile Show and Association Managers, now the Automotive Trade Association Managers.

Robert E. Lee

His funeral in St. Louis, Saturday, Jan. 26, was attended by many prominent figures in the automotive industry.

Ruth Lee, his widow, survives.

New Car Financing in '34 Increased 48% Over 1933

Retail financing of new passenger automobiles for the year 1934 was 48½ per cent higher in dollar volume than for 1933 and about 95 per cent higher than for 1932, according to preliminary estimates by the Department of Commerce.

The dollar volume in December on a daily average basis was up 33½ per cent from Dec., 1933, and 78 per cent from Dec., 1932. The decrease from Nov. to Dec., 1934, was about 29 per cent compared with a decrease of about 32 per cent last year and an average decrease of 9 per cent between these two months for the past five years.

350,000 in February

(*Continued from page* 97)

day as a starter. The Cincinnati branch has not assembled cars since 1932, and represents the fifth Ford branch to resume assembly operations this year.

Buick announces that production schedules have been boosted twice during January, with February schedules also increased from previous estimates. All divisions of the company are once more operating five days per week, with three shifts daily in the axle and differential plants and two in the transmission building. The statement says that unfilled dealer orders are sufficient at present to keep the plant operating at present schedules throughout the remainder of the first quarter.

Dodge announces deliveries for the first 19 days of this month of 10,230 Plymouth and Dodge cars and 2145 trucks. These figures compare with 5287 in the same period of last year. For the week ending Jan. 19 truck deliveries totaled 751, and the Plymouth and Dodge car total was 3789.

Chevrolet will be getting into active production in February on its Master series cars, another contribution to higher schedules for the coming month. During January Chevrolet production was largely confined to standard models and trucks.

January production for Plymouth will probably represent the biggest single month in that company's entire history.

CALENDAR OF COMING EVENTS

SHOWS

Chicago Automobile Show...Jan. 26-Feb. 2
Montreal, Que., Automobile Show Jan. 26-Feb. 2
Springfield, Mass. Automobile Show, Jan. 28-Feb. 2
Lancaster Automobile Show..Jan. 29-Feb. 2
Harrisburg Automobile Show.Jan. 30-Feb. 2
Omaha Automobile Show.....Feb. 3-9
Wilmington, Del., Automobile Show, Feb. 3-9
Kansas City, Mo. Automobile Show Feb. 9-16
Denver, Colo. Automobile Show..Feb. 10-23
Peoria, Ill., Automobile Show....Feb. 13-17
Bethlehem, Pa., Automobile Show. Feb. 18-23
Evansville, Ind Automobile Show.Feb. 23-27
Des Moines Automobile Show Feb. 25-Mar. 2
Minneapolis Automobile Show....Mar. 9-16
Mankato, Minn. Automobile Show Mar. 16-23

ANNUAL MEETINGS

Automotive Parts & Equipment Mfrs., Inc.—Chicago .....Jan. 29

CONVENTIONS

Lafayette, Ind. (Purdue University), Automotive Service Conference, Mar. 21-22

The 1935 GMT T-16

INCREASED carrying capacity, more power and torque, better fuel economy and improved appearance feature the General Motors Truck Company's T-16, T-18, T-23, T-33, T-43 and T-46 models for 1935. The T-18 model provides as optional equipment a new dual performance rear axle which, in combination with the four-speed transmission, gives eight speed forward and two in reverse. The T-46 also is available as the T-46-H with heavier rear axle, bigger springs, larger tires, etc., giving it a gross rating of 22,000 lb. as compared with 19,000 for the T-46.

With the exception of the T-16, whose appearance is unchanged, all of these models now have as standard inclined radiators with chrome-plated center bars, longer hoods with three horizontal louvers, full crown fenders with valances, and chrome-plated top hood hinges. The hoods are now fastened to the radiator and cowl instead of to the frame as formerly, thus eliminating distortion due to frame weaving. A deluxe chassis group of additional appearance refinements is offered at a nominal package price comprising an ornamental radiator cap, rubber step plates and full chrome headlamps, hood louver strips, hood handles, spring bar bumper, and front and rear hub covers. Included in this group is a chrome radiator shell on the T-18 and T-23.

The new two-man cabs have more windshield slope, cab skirt, sealed seat box cover and walnut finish instrument panel and garnish moldings. The deluxe cab in addition features full chrome windshield frame, dual wipers and extension mirror; sunglare shield, locking door handles, full interior trim, metal bound "mastipave" floor covering, arm rest, order book and tool compartments as well as chrome instrument bezel. The sleeper cab is now of the deluxe type providing many of these refinements. Seven color combinations at no additional cost are offered optionally with the deluxe cabs and chassis package.

The gross rating of the T-16 has been increased from 9300 to 10,000 lb. with a gain in payload capacity of 575 lb. Paralleling this increase in weight, the power output of the L-head six-cylinder engine has been stepped up from 70 hp. at 3300 to 84 hp. at 3500. Moreover the torque curve is much flatter so that peak torque of 152 lb. ft. is maintained from 1200 to 2500 r.p.m. This compares with last year's

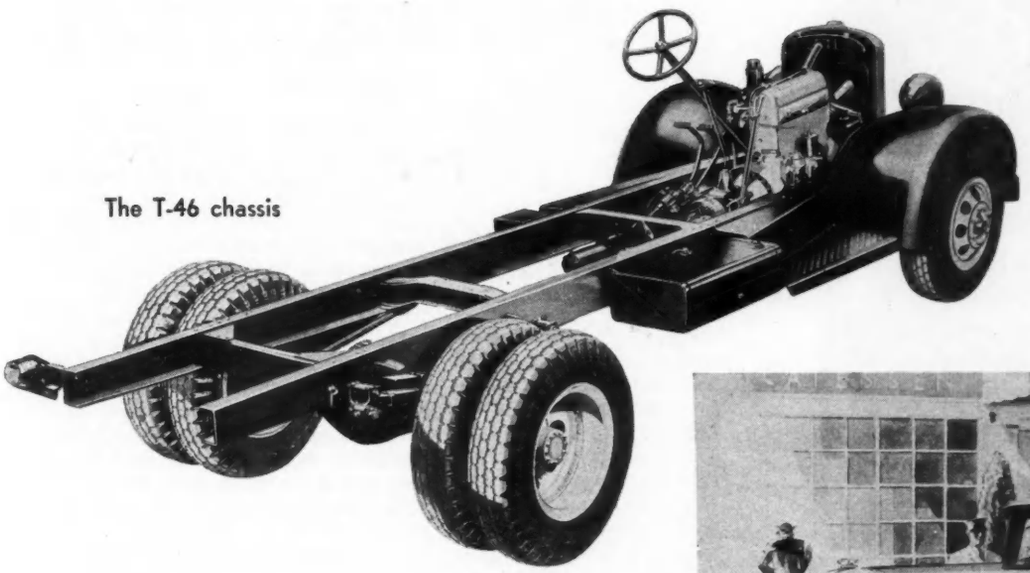
PRICES OF NEW GMT's

Model	Maxmum Gross Rating	Chassis Price	Price Applies to:
T-16	10,000 lbs.	$620	131-in. wb. standard base chassis with 30 x 5 6-ply front and 32 x 6 8-ply single rear tires.
T-18	11,500	777	140¾-in. wb. standard base chassis with 30 x 5 6-ply front and 32 x 6 8-ply single rear tires.
T-23	13,000	1,115	142-in. wb. standard base chassis with 6.50/20 6 ply single front and dual rear tires.
T-33	15,000	1,655	142-in. wb. standard base chassis with 32 x 6 8-ply single front and dual rear tires.
T-43	17,000	1,795	142-in. wb. standard base chassis with 32 x 6 8-ply single front and dual rear tires.
T-46	19,000	2,285	145-in. wb. standard base chassis with 32 x 6 10-ply single front and dual rear tires.
T-46H	22,000	2,625	145-in. wb. chassis with heavy rear axle assembly and base 34 x 7 10-ply single front and dual rear tires.

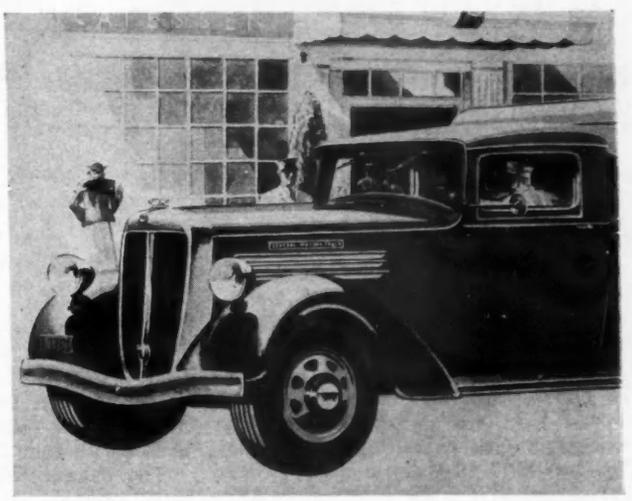
Hydraulic brakes are a feature of the improved T-16 chassis

to T-46 Models

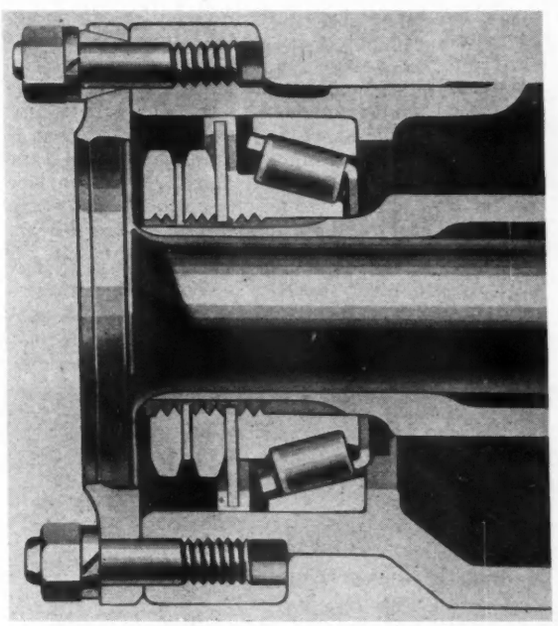
by
Don Blanchard
Editor,
Automotive Industries



The T-46 chassis



New radiator and hood styling on the T-18 to T-46 models. The cab also is a new design. The model illustrated is the T-43



The new rear axle "piston ring" oil seal

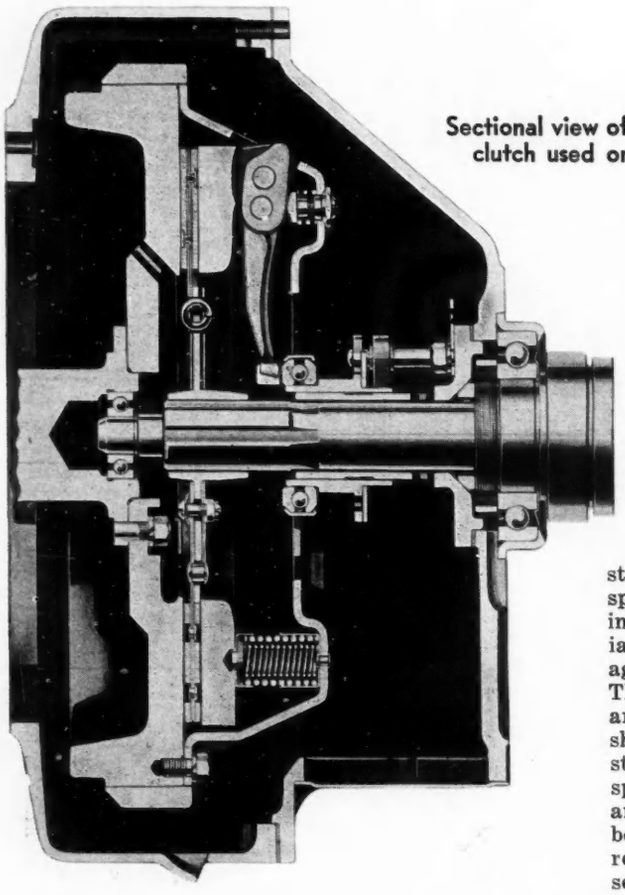
engine which held its maximum torque of 147 lb. ft. only between 1400 and 1800. This improvement in engine power and torque is attributed to a new 6 to 1 combustion chamber and less restriction in the intake passages. Gasoline mileage is said to be better than in 1934.

In connection with the increased output of the engine, main bearing area has been increased 4 per cent, the journals being slightly larger in diameter. The thrust bearing has been removed from the rear center bearing and is now located at the front of the crankshaft, providing increased thrust bearing surface. Crankpin diameters have been increased from 1⅞ to 2 in. The crankshaft is now 14 lb. heavier and 85 per cent counterweighted.

Other improvements on the T-16 include new chrome-nickel steel steering knuckles having 20 per cent more strength, new "piston ring" oil seals in the rear axle, forged instead of pressed steel rear axle spring seats, Centrifuse brake drums on all four wheels with front drum diameters increased from 12 to 14 in., and hydraulic brakes with the hand lever operating the rear shoes mechanically.

The T-18 now carries a gross rating of 11,500 lb., an increase of 1000 lb. and giving 755 lb. more payload capacity. The power output of the "221" valve-in-head engine used in this model, as well as in the T-23, has been raised from 69 hp. at 2800 to 77.5 hp. at 3200. Maximum torque has been increased from 155 to 161 lb. ft. Fuel mileage is substantially improved, it is claimed.

This engine now has a 5.1 compression ratio, compared to 4.6 last year, the increase being obtained by the use of high-compression pistons. Other engine changes include the adoption of an improved carburetor, insulation of the carburetor from the exhaust manifold, and an increase in the spark plug



Sectional view of 12-in. plate clutch used on the T-46

gap. An engine thermostat is standard as are flat-tube and fin radiators.

The T-18 has a new heavier rear axle with larger housing, differential, "piston ring" oil seals and drop-forged spring seats. The diameter of the axle-shafts has been increased from 1⅝ to 1¾ in. and at the differential end the number of splines is now 16, instead of 10. Gear ratios are 5.67 and 6.60. The spacers between main and auxiliary springs are now forgings, and the steering knuckles have been strengthened 20 per cent.

The dual performance rear axle offered optionally on this model is an Eaton unit giving reduction ratios of 5.14 and 7.15. Since this unit was described in detail in Dec. 22 *Automotive Industries*, it is unnecessary to discuss it further here except to say that it is operated by a lever in the cab adjacent to the transmission shifter.

Front springs on the T-18 have been strengthened by making all nine leaves 0.284 in. thick and double-wrapping the rear spring eye. The clutch, used on both the T-18 and T-23, is of single-plate design with vibration dampener springs between the disc and hub. Hydraulic brakes are standard with Centrifuse drums on all four wheels, those on the front now being 14 instead of 12 in. in diameter. A propeller-shaft parking brake is now standard.

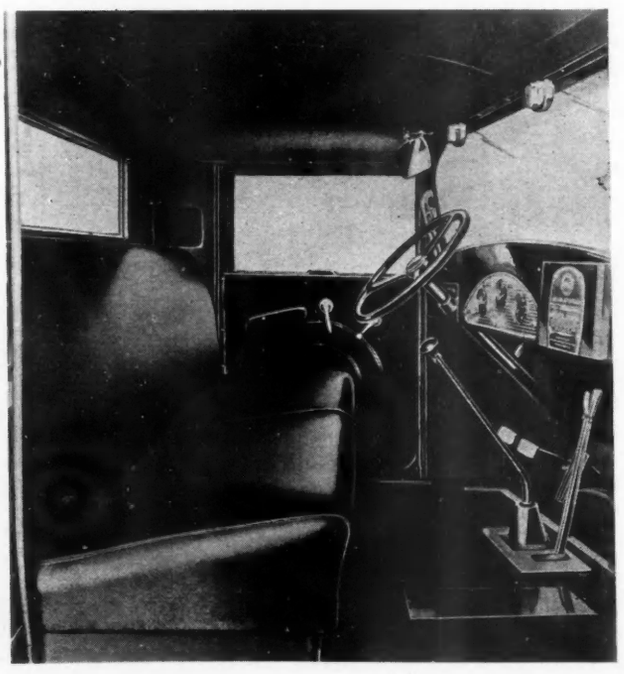
The gross rating of T-23 has been increased from 12,500 to 13,00 lb., the increase in payload capacity amounting to 530 lb. The rear springs have been strengthened, the main springs being 50 x 2½ in. in 1934 and the auxiliary spring 37 x 2½ in. against 29½ x 2½ in. The rear spring brackets are heavier and the shackles are forged instead of cast. The cast spacer between the main and auxiliary spring has been eliminated. A new rear axle with square section banjo-type housing and heavier carrier and ring gear is used. Gear ratios are now 5.83 and 6.80. Hydraulic brakes are standard with larger cast nickel iron drums at the rear, giving a total lining area on all four brakes of 296 sq. in.

The increase in the gross rating of T-33 amounts to 1000 lb., bringing it to 15,000 lb. All but 10 lb. of this increase is available for payload. The 257 engine used in this model has the same improvements as the 221, and as a result its peak output is now 83 hp. at 2800 with 80 hp. at the governed speed of 2500 as compared with 76 hp. last year at the same governed speed. Torque also is up from 185 to 190 lb. ft. and the curve is flat from 800 to 1600 r.p.m. as compared with 1000 to 1600 r.p.m. previously. A marked increase in fuel mileage is said to have been accomplished in this model. A single-plate clutch of larger diameter and with spring mounted disc has replaced the double disc design used last year. The number of leaves in the rear springs has been increased from 8 to 10 and the leaves of the auxiliary springs are thicker. Steering has been improved by shackling the front springs at the front and by relocating the drag link. Vacuum booster operation of the hydraulic brakes is standard on this model with Westinghouse air-operated brakes optional.

The T-43, which also has the 257 engine, now has a gross rating of 17,000 lb. as compared with 16,000 lb. in 1934. The increase in payload capacity is 955 lb. This model also has a new single-plate clutch, improved steering, booster operated hydraulic brakes with air-operated brakes of larger size than on the T-33 optional.

There has been no change in the gross rating of the T-46, but it is now stated to give more miles per gallon as the result of the adoption of a new Zenith carbureter. The clutch in this model is a 12-in. single-plate unit and optional overdrive or underdrive five-speed transmissions are available for $175 as compared with the former price of $228.50. Front axle tread has been increased more than 8 in., giving a sizable reduction in turning circle. Rear springs are heavier. Booster operated hydraulic brakes also are standard on this model with air brakes optional.

A T-46H model rated at 22,000 gross has been added to the line. This unit is the same as the T-46 except that it has a stronger frame, the T-51H type rear axle with spiral bevel carrier (double reduction optional at extra cost) and springs, larger brakes, I-beam radius rods, 10 stud wheels and 34 x 7 in., 10-ply base tires.



Interior of the new GMC cab

Brake Drum Design and Materials,

and Their Effects on Cost, Performance and Durability

IN a paper by Chris Bockius of Raybestos-Manhattan, Inc., and J. Harold Hunt of Motor Wheel Corp., some of the equipment required for brake tests and the methods employed in interpreting data obtained in such tests were delineated and, in addition, brake-drum and brake-lining requirements were discussed.

Increased speeds and increased density of traffic call for increased braking power; on the other hand, the use of smaller wheels, necessitating a reduction in brake drum diameters, and the more complete enclosure of wheels in efforts at improved streamlining, which interferes with heat dissipation, have made the braking problem increasingly difficult.

When initial cost alone is considered, the low-carbon stamped drum ranks first, but it is the worst offender as regards metal pick-up; that is, the metal will readily flake off, embed itself in the lining, and cause scoring. Heat is the biggest cause of metal pick-up; foreign substances in the drum and lining come next. In the course of a search for a stamped drum which would not score, the following combinations of steel were tested: Low-carbon and high-carbon, nitrided and carburized alloys, specially heat-treated and specially rolled drums, and drums on which a braking surface of another metal had been built up by spraying.

Some of these showed possibilities as brake drums, but they were either troublesome in production or else prohibitive from the cost standpoint. All of them would score at high temperatures such as would result from continuous braking down a long hill or from individual stops from very high speeds.

A new type of steel which came into general use for stamped drums this year and which has been shown by tests to be a material improvement over S.A.E. No. 1025 so far as scoring is concorned, is a high-manganese steel containing a minimum of 1.40 per cent manganese. It is a very little more expensive than ordinary steel and will be used in a number of 1935 cars.

Manufacturers of commercial vehicles were first to demand better drums, and, in response to this demand, solid cast-iron drums of special iron were developed, which today are in almost universal use. Manufacturers of passenger cars realized that a drum with a cast iron braking surface would solve the worst of their braking problems. That such drums are not being used today on big-production models is due principally to the increases in cost and unsprung weight.

In extending the field of research for material, the composite, or built-up type of drum was developed. First, a mill section of alloy steel was coiled and welded into a ring, forming the braking surface, and to this was fastened a light steel back by either riveting or welding. This allowed the use of a higher grade steel for the braking surface only and a back of ordinary steel of a much lighter section. By this method a lighter drum was produced at less expense than a solid alloy-steel drum, machined all over, which had been used to some extent on some of the larger cars. The next step was to make a built-up drum using cast iron for the braking surface in combination with an ordinary light steel back. This has been one of the major improvements in brake drums to date.

In Centrifuse drums, use is made of an iron with 0.30 per cent of chromium, which latter endows it with the ability to resist structural changes due to heat, and with small contents of other alloying elements, such as molybdenum and nickel, which reduce the rate of wear slightly. Considering cost, machinability and wear, it seems that the optimum molybdenum content is 0.35 per cent. Nickel should be limited to the range 1.00-1.50 per cent. While the addition of these two elements results in reducing the rate of drum wear, their cost and their adverse effect on machinability more than balance the gain in cars in the low and medium-priced fields.

One of the reasons for developing the composite drum was to combat distortion. With a stamped drum the degree of flexibility at the open and closed ends is limited. By making the ring and back two separate units, the open end of the drum can be held rigid by means of a good heavy rib. The closed end can be kept flexible by using a light back, as the torsional load does not run very high. When the open end of a drum is forced out, or bell-mouthed, the back is bent in. This movement can be retarded by forming the back to resist a movement in this direction.

In ordinary braking not enough heat is generated to offer serious problems in heat dissipation. But when "high-speed" stops are made at frequent intervals or when the brake is used continuously in descending long hills, drum temperatures of 1,000 to 1,200 deg. F. are often recorded. Drum distortion, scoring, erratic performance, excessive wear of the lining and shoe distortion are the results of high temperatures. If some method of keeping the temperatures down could be devised, a lot of brake problems would be solved all at once.

Test Procedure for Measuring Quality of Diesel Fuel Being

by Joseph Geschelin
Engineering Editor, Automotive Industries

ATTENDANCE and discussion at the Diesel sessions gave plenty of evidence of the intense interest which has grown around the automotive Diesel development. Perhaps one of the biggest problems involved is the matter of fuel specifications and much progress already is evident in that direction. As readers of *Automotive Industries* know, several years ago the Diesel fuel problem was tackled by a volunteer committee of oil men headed by T. B. Rendel of Shell Petroleum Corp. A summary of their work to date is contained in the "Progress Report of Volunteer Group For C. I. Fuel Research," which was presented by Mr. Rendel. This dealt chiefly with the changes made in the C.F.R. test engine to adapt it to tests on Diesel fuels.

The standard C.F.R. piston is used and the clearance adjusted to .022 in., leaving practically no space between the piston and the surface of the head. All of the air taken in on the suction stroke is thus compressed into the horizontal cylindrical combustion chamber. The passage between the cylinder proper and the combustion chamber is so located that the incoming air is directed tangentially to the chamber, along the base of the injector end of it, producing very high controlled turbulence. Fuel is injected into the end of the cylindrical combustion chamber horizontally, parallel to the axis, but it will be noted that the injector is not placed centrally in the chamber. This is to insure that the injector tip shall be well in the whirling air stream and thus be kept free from carbon accumulation. The volume of the separate combustion chamber is varied by means of a movable compression plug.

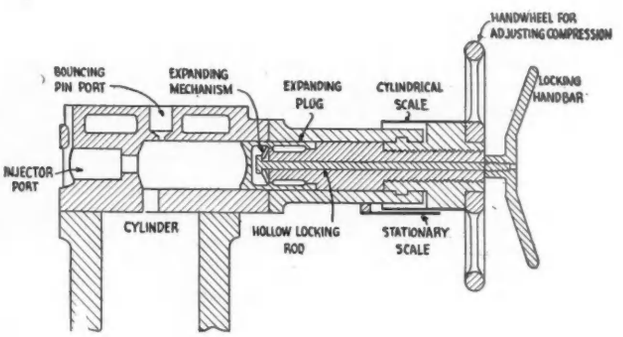


Fig. 2—Section through cylinder head showing mechanism for varying volume of combustion chamber

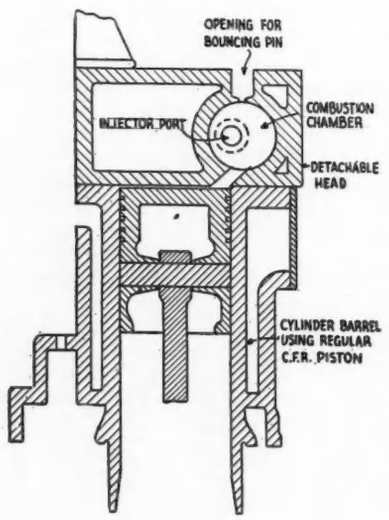


Fig. 1—Section of new Diesel cylinder for C.F.R. engine

It is possible to use both the critical-compression-ratio method of rating fuels described by Pope and Murdock and also, in conjunction with a modified type of bouncing pin, the delay method suggested by Boerlage and Broeze, and to obtain measurements of the ignition quality of a Diesel fuel with reasonable accuracy and with a minimum amount of engine maintenance.

When operating according to the delay method, the test is very similar to the octane number antiknock test for gasoline. The bouncing pin has been rebuilt to break instead of make an electrical circuit when the pin is "bounced" upward by the shock of combustion. It is thus used to stop a current that is started by a cam on the end of the fuel pump shaft, timed to make contact at some instant in a definite relation to the time of injection. The total current that flows from the time the fuel is injected until the time combustion begins, i.e., the time when the pin is "bounced," is a measure of the delay period. By allowing this current to flow through a regular knock-meter as used on the gasoline-knock testing engine, it is possible to find a mixture of reference fuels with the same knock-meter reading, and hence delay period, as the fuel under test. By using mixtures of two standard fuels such as cetene and alpha methylnaphthalene (or suitably calibrated secondary reference fuels) it is possible to obtain the ignition quality of the fuel expressed in relative terms, such as cetene number. Fig. 3 shows a sketch of the type of bouncing pin circuit used in this test.

In addition to this hook-up, an optical-indicating device is also provided for the purpose of determining the exact point at which the pin begins to bounce. Fig. 4 shows diagrammatically how this is accomplished. A small prism A, mounted on the contact arm of the special bouncing pin, moves through a small arc when the pin is bounced by the shock of combustion. The beam from a small light mounted on the flywheel is reflected by prism B on to prism A so that when the flywheel is revolving with the pin at rest, the reflected light appears, on looking into prism A, as a continuous line of light. Then with the engine firing, a definite deflection of the line of light occurs when the pin is bounced by the shock of combustion; the point of this deflection being noted on a scale, graduated

Ignition Perfected

in degrees crank angle, which is fixed above the flywheel. A sliding pointer, movable along the scale, is provided to facilitate the determination of the point at which the deflection of the line in degrees of crank angle occurs.

Using this modified type of high-turbulence C.F.R. engine and equipment, the committee has begun work on a program having for its objective the development of a method of measuring the ignition quality of Diesel fuels which can later be recommended for universal adoption. The work naturally falls into two main divisions and of these the first has been subdivided into three sections as follows:

A-1—Perfecting the test engine and technique.

A-2—Suitable scale for expressing ignition quality.

A-3—Effect of various engine factors on the relative rating of different fuels.

Already a fair amount of work has been done under Division A-1 by the committee and a few of the members have also carried out a number of experiments under A-2. Approximately ten of the new type engines are now in operation in the laboratories of the members of the Volunteer Group and a tentative procedure for running the engine according to the delay method has been worked out, though as yet there is not enough experience with this procedure to justify even a tentative adoption.

As a result of about 18 months' experience it has been found that the delay method of testing is not as rapid as the method employing the critical compression ratio, but is somewhat more accurate. Average deviations in terms of cetene numbers as a result of 25 tests were ±0.8, the maximum variations being ±2.2. This compares fairly satisfactorily with the octane-number tests of gasoline although, of course, it should be remembered here that these reproducibility tests involve only one engine and one operator.

In regard to the use of standard fuels, the two fuels that seem to be the most widely adopted at the moment are cetene, which will shortly be available from du Pont de Nemours, and alpha methylnaphthalene, which has been obtained from the Reilly Chemical Company, Indianapolis.

In discussion Harte Cooke recommended a tentative program to determine fuel specifications suitable for each make of engine. In contrast to this, C. L. Cummins reported that his company has found but little difference in any of the fuels now available, and E. T. Vincent of Continental Motors Corp. opined that if the engine is right it can burn any fuel without difficulty.

Both Good of Chrysler and C. M. Larson pointed out the importance of fuel viscosity not only in its effect upon engine performance but also with respect to seasonal changes. These men also showed the need for clean fuel of lighter viscosity as an aid in prolonging the life of the fuel pump. This point was stressed by Carl Bain of Bosch in discussing the Diesel injection system.

A. E. Becker reported that different makes of engines seem to require different fuel specifications. He also made an interesting point of the fact that as the compression ratio is stepped up the field of Diesel fuel will broaden permitting the use of a simple specification to cover most needs—the reverse is true of gasoline engines since with increase in compression ratio, the field of regular gasolines is immediately restricted.

It was interesting to learn that Chrysler has been carrying on a large scale program of investigation of automotive Diesel engines and has tested many different makes.

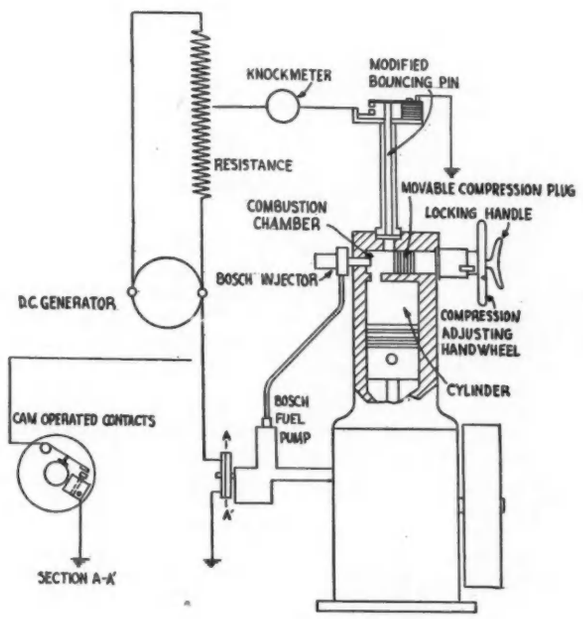


Fig. 3—Modified bouncing pin circuit for delay measurements

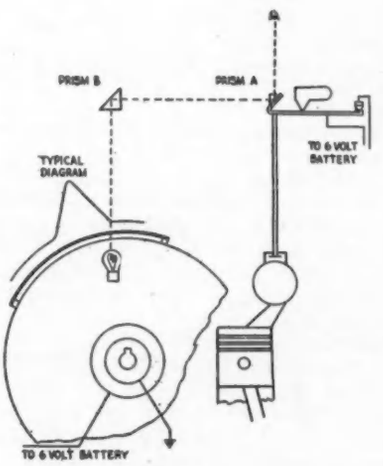


Fig. 4—Hook-up of optical indicating device

Ex-Cell-O Injection System Described

C. R. Alden of Ex-Cell-O Aircraft & Tool Corp., described in great detail the special unit-type injection system brought out by his company some few months ago. This pump was first described in *Automotive Industries*, June 30, 1934, and was shown at the SAE summer meeting in 1934. The most important points brought out in his paper, "Design and Development of Injection Apparatus for High Speed Diesel Engines," were: the self-contained construction of the unit, including the hydraulic elements, governor, filter, etc.; standardization of individual parts and mounting on the engine; foolproofness; freedom from adjustments requiring a detailed knowledge of fuel pumps; ease of replacement of individual elements; self lubrication making for longer life.

Many detailed questions concerning the functioning of the new fuel pump and its manufacture were propounded, various discussors including C. L. Cummins, Max Hoffman, F. E. Watts, C. M. Larson, and Harte Cooke. Max Hoffman incidentally advised that his company has been studying the Ex-Cell-O fuel pump for some time and has found it to be very satisfactory on the basis of test work to date. F. M. Young, president of Young Radiator Co., presided at this session.

Uniontown Detonation Test Report

PERHAPS the most impressive showing was made by the young Fuels and Lubricants Activity whose first year of participation in the SAE was under the leadership of A. L. Clayden. Several interesting reports were presented at the session at which Mr. Clayden presided. One of these was the "Report of Cooperative Fuel Research Committee 1934 Detonation Road Tests" dealing with the motor fuel detonation phases of cooperative fuel research, which was prepared by C. B. Veal. This is quite similar to the report read at the A.P.I convention last fall as reported in *Automotive Industries*, Nov. 17, 1934. However, the significant difference between the two reports lies in the new sections on the factors affecting fuel-engine relationships and the recommendations for improving test equipment and procedure, as foreshadowed by the A.P.I. meeting discussions.

Uniontown test experience indicates that much has to be learned concerning the behavior of engines and the differences between engines even of the same make that cause variations in the acceptance of the same reference fuel. Apparently fuels are affected by unknown factors in the engine resulting at times in great differences between engines of the same make and often in the same engine during the course of the test.

It is agreed by the committee that refinements are needed in the technique of rating fuels on the road as well as on the C.F.R. engine. In fact the report indicated a definite line of investigation about as follows:

1. Determination of influence of exhaust system characteristics upon knock ratings.

2. Improvement of bouncing pin indicator and even the adoption of a new method.

3. Modification of method of test.

In road test procedure the committee finds a need for pursuing the following line of investigation:

1. Effect on knock rating of knock intensity at which rating is made, speed at which knock is measured, mixture temperature, and atmospheric conditions.

2. Elimination of personal factors by instrumentation.

3. Study of the effects of engine design and engine condition upon test results.

In discussion, C. S. Brooks of the Bureau of Standards, presented test data on correlation work that was carried out with eight fuels on 29 cars of the same make. The scheme was to test as many cars of one make as possible, and run a great number of tests. With this procedure the Bureau of Standards was able to get correlation between cars with a precision of 0.7 of an octane number.

Lubrication of Worm Gearing

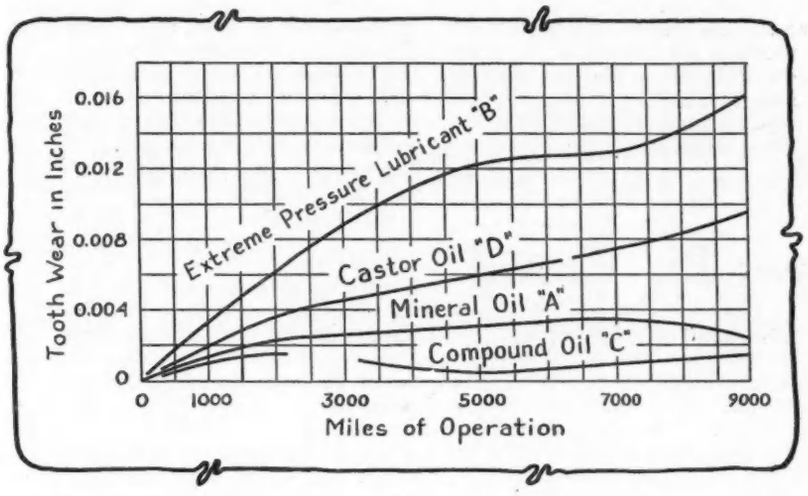
MUCH has been said about rear axle lubrication particularly hypoid and worm gearing in heavy-duty truck transportation. The worm gearing problem was investigated by C. H. Schlesman of Socony-Vacuum and a summary of the project was presented under the title: "Lubrication Requirements of Automotive Worm Gearing."

It is concluded from this investigation that no single product possesses all the desirable characteristics of a worm gear lubricant but that the best product must be selected for each class of service. Another important conclusion is that with conventional worm gearing the most satisfactory lubricant, for general use where tooth loadings are not excessive, is a well refined oil without any blending agents. Where extra heavy duty is required of worm gearing, as in the tractor-trailer jobs on the Pacific Coast, a compounded lubricant is to be preferred. Lubricants of this type will prevent tooth scuffing even at abnormally high loading.

It was pointed out by Clayden and Nealy that there is a tendency to confuse the role of E-P lubes in axle lubri-

Table I—Comparing the Weighted Service Value of Lubricants. Weight Assigned in Accordance With the Importance of the Various Properties in Average Fleet Operation

Lubricant	Churning Loss	Efficiency	Maximum Load	Fatigue	Stability	Wear	Surface Finish of Corrosion	Total	Per Cent
Weight	20	50	30	20	100	30	20	270	100
A	12.2	23.2	17.8	15.1	83.2	18.5	12.0	182.0	67
B	12.3	26.0	25.9	18.2	17.2	2.6	10.0	112.2	41
C	12.9	23.3	18.0	12.5	81.6	25.6	12.1	186.0	68
D	14.1	27.0	28.6	20.7	49.6	14.0	14.0	168.0	62
X	...	25.6	15.1	15.1	...	19.2	11.3	....	..



Rate of wear as affected by lubricant. Timken worm and wheel transmitting 60 hp. at 65 m.p.h. at 230 deg. Fahr. lubricant temperature

cation. E-P materials were originally designed to take care of steel to steel hypoid gear sets, but due to the heavy loading of worm gear axles, attempts have been made to use E-P lubes for worm gearing. This is not recommended since many of these products are extremely active and cause either severe corrosion or unusual wear. This is substantiated by Dr. Schlesman's work which shows that certain E-P materials cause severe pitting while others wear the entire contact area away.

Of course there are E-P lubes on the market that are not so objectionable in this respect, but as Mr. Clayden remarked, if you use a good refined oil and then overwork the axle it may fail very rapidly; if you want the axle to run under heavy duty conditions and stand up, then an E-P will keep the job running until it fails through rapid wear. The whole thing is a matter of compromise.

The danger of using active E-P lubes with worm gearing lies in the corrosive effect which causes pitting of tooth surfaces and produces areas of incipient fatigue failure. This observation applies equally well to the use of compounded materials containing free fatty acids.

Table 1, taken from the paper, shows a method of weighting the characteristics of competitive lubricants to determine the best compromise material. This method should be of some interest to fleet operators.

Oiliness and Its Effects on Bearings

A. L. Beall presided over the conference on oiliness of crankcase oils and lubrication of copper lead bearings, one of the most-discussed topics of the day. While neither of the two prepared papers was available for distribution, the results and tentative conclusions were freely discussed in open meeting. G. M. Maverick of the Standard Oil Development Co., summarized the available experience on oiliness in his paper "Effect of Engine Wear on General Features of Operation."

While there is but little comprehensive data available either on oiliness or the action of certain materials on the new types of bearings, the author makes the following observations:

1. That free fatty acids in oils have been responsible for bearing failures.

2. That many types of addition compounds used in compounded oils produce bearing corrosion although there are other compounds that give no trouble whatever.

3. Opinion in general is divided as to the need for addition agents.

4. Laboratories seem to feel that the claims for blended oils have not been substantiated by formal tests and fail to show increased horsepower, better economy, etc.

5. That there is a great trend in Europe to compounded oils.

6. That a true E-P is not needed in crankcase lubrication although it may be valuable for running in.

7. That even good mineral oil if used for a long time will increase in acidity and may cause bearing corrosion.

8. That the future of high output aircraft engines may depend upon development of compounded oils of the right type.

As a result of the initial investigation, the author feels that it is unsafe to draw conclusions of any general nature. For this reason it would be unwise to make any blanket recommendation against the use of addition agents, particularly when it is known that certain agents are beneficial.

A study of bearing failures and the relation of these phenomena to lubricants was made by H. C. Mougey and is contained in a report, "Effect on Bearing Metals." Mr. Mougey notes, as did Dr. Maverick, that some compounded oils are decidedly good and cause no corrosion. An interesting point made by Mr. Mougey is that while improvement in engine performance has been difficult to prove, any improvement that has been noted seems to be due to the use of oils of low viscosity.

In the opinion of the author, laboratory tests are of little value in the selection of compounded oils, although the laboratory should be used to eliminate undesirable products and keep them out of the road testing equipment. The acid number of the lubricant also is no indication of its corrosive or non-corrosive properties and this element, too, must be checked on the road. In this connection, Dr. A. W. Burwell said in discussion, that formic and acetic acids are really the harmful elements and may be produced in any unstable oxidized oil.

Mr. Mougey concluded from the evidence that it is necessary to consider the combinations of oils and bearing materials if good results are to be obtained. Some combinations are good, others very bad. He stated the possibility of selecting non-corrosive addition agents and recommended work along this line since future engine development may require compounded oils.

Discussion by many important figures in the petroleum industry brought out the fact that the many elements entering into bearing failures are now fairly well understood and that the situation is well under control. For example, it is known that certain types of materials will cause trouble and obviously their use can be avoided. C. M. Larson said that fixed fats are more useful than the fatty acids and that certain types of fixed fats are perfectly stable and non-corrosive. The important thing is to get a certain degree of balance of chemical stability and oiliness properties. Incidentally, Mr. Larson expressed the opinion that within five years or so, 10-W oil would be used for year-round lubrication of motorized equipment.

Elmer S. Sperry presented some slides and tabular data obtained in testing various lubricants on the Sperry-Cammen Adher-O-Scope. These data show the unique sensitivity of the in-

strument and its ability to analyze oils having seemingly similar characteristics. Thus two oils having the same viscosity have a different ability to support loads—this is shown quantitatively by the instrument. Again the instrument has shown that with a certain product the residuum is better than the distillate. The machine has been able to show that oiliness additions improve the adhesion of even poor oils of low viscosity.

Production Session Draws Big Crowd

WITHOUT a doubt the most successful National Production Activity meeting in recent years was held Friday under the leadership of W. H. McCoy of General Motors Research. The five papers on the program were given in brief detail in *Automotive Industries* last week and need not be covered here. However, they were well received by a huge audience of practical shop executives who participated in a lively discussion running far into the night.

Much interest was shown in the paper presented by W. F. Wise of Ex-Cell-O which dealt with single-point tool turning and boring. Ira Snader, technical expert of the company, answered many detail questions on the operation of the Ex-Cell-O equipment as well as the manner of handling specific applications of these machines.

In discussing E. J. Abbott's paper, K. L. Herrman pointed out that his company had been very successful in judging surface finish of precision parts by microscopic examination. Dr. Abbott felt that microscopic examination was a valuable aid but that it does not give qualitative results as does the Profilograph. He also emphasized the value of the Profilograph for the establishment of production standards on surface finish. The idea is to make up standard specimens of acceptable finishes and then compare production work with these samples.

The magnetic testing of materials as described by A. V. DeForest is matter of intense interest and created much discussion. W. J. Cummings of the Surface Transportation Co., reported his experience with the Magnaflux testing device which was developed by DeForest. It is being used to check all stressed parts of bus equipment including crankshaft, connecting rods, spindles, etc. This work has led to the setting up of a comprehensive salvage procedure in which the parts are inspected for incipient failure and steps taken to prevent failure. In this connection they will file out tool marks, file off manufacturers trade marks in certain places, round off sharp corners, and sometimes drill out small cracks. They have found that most surface imperfections leading to failure result from incorrect design or poor surface finish rather than imperfection in the steel specification or treatment of the metal.

At the request of Mr. McCoy, Howard Dunbar described the experimental Norton machine for the conjugate grinding of camshafts. This information was not included in the original paper because the machine has not yet emerged from the laboratory stage. In conjugate grinding, all the cams are ground simultaneously with an individual wheel for each cam. The wheels are mounted on fixed centers as is the camshaft. While this differs vastly from the usual cam grinding cycle, the biggest point of difference is that the grinding wheels are not cylindrical but out-of-round to the extent of the lift of the cam. However, the wheels are so large (about 42 in. in diameter) that lack of concentricity is not usually apparent to the eye.

In operation, each cam is timed with the wheel, so as to have the proper coordination of cam and wheel form. Wheels are dressed with a special truing mechanism comprising an individual diamond dressing tool for each wheel, mounted on slides diametrically opposed to the cam centers. The truing mechanism is actuated by a master cam arrangement.

Many of those in the audience came down to hear Peter Fassler talk about automotive resistance welding. The burden of his message is that the most important element of welding machine design is high power factor, at least around 0.50. He claims that the power factor of most machines in use today is around 0.25. According to Mr. Fassler, one of the reasons for low power factor is the use of an iron housing around the transformer and he recommends a non-ferrous housing for this purpose, as is done at the Ford Motor Co.

W. B. Hurley of the Detroit Edison Co., also emphasized the great importance of power factor. With better power factor the machine may be made smaller for the same duty; it will cost less; and improvement in power factor will help solve one of the big problems of the central station.

Reliable Laboratory Methods Needed for Testing Plane Engine Oil Stability

A PAPER on "Aircraft and Aircraft-Engine Performance as Influenced by Engine Oils" was presented by S. D. Heron of Ethyl Gasoline Corporation. Mr. Heron was formerly connected with the Materiel Division of the U. S. Army Air Corps and the paper was based on data obtained in that position. The author particularly stressed the need for the development of reliable laboratory methods of determining the stability of oils for aircraft engine use. The aircraft engine manufacturer and operator are subjecting engines to increasingly high duty and require better oils for this purpose. New methods of refining have rendered possible the production of oils which are greatly improved in several of their qualities, but in the present state of knowledge the use of such oils in aircraft engine service involves uncertainty as regards stability.

In the past, 160 deg. F., has been regarded as the maximum allowable "oil in" temperature, and this maximum has been gradually increased to 185 deg. F. with normal oils. Available data indicate that increases in "oil in" temperature is sensibly without effect on the production of solid gummy deposits such as produce piston-ring sticking, so long as the "oil in" temperature is the only variable. In general, the accumulation of solid deposits in the piston ring grooves limit the time between engine overhauls. Determination of the suitability of an oil for aircraft engine use by full-scale tests appears to constitute the most difficult and uncertain engine test which the aircraft-engine manufacturer or operator has to undertake.

Mr. Heron gave it as his opinion that the establishment of laboratory methods of determining the effective value of a fuel in an aircraft engine is a relatively simple problem in comparison with the determination of a suitable test for predicting the stability of oils in aircraft-engine or similar high-duty service.

It appears possible that compounded oils may be extensively used in aircraft engines in the future, and should this occur the need for test methods which will predict stability will become still greater than it is with purely mineral oils.

Finishes Urged as Topic for All S.A.E. Annual Meetings

IN a paper on "How to Finish a Truck," by P. R. Croll and L. E. DuBey of the Paint and Varnish Division of the Pittsburgh Plate Glass Co. the suggestion was made that a permanent place be given on the annual program of the S.A.E. to the subject of vehicle finishing. A representative committee or board should be appointed to prepare a status report on the new developments of the past year. Especially should time be allowed on the program for the discussion of painting difficulties.

Combustion Chamber Design Paper Results in 3-Way Debate

A THREE-CORNERED argument on factors determining and methods of designing combustion chambers was a major, though unprogrammed feature of the passenger car engine symposium of the S.A.E. annual meeting. The argument was started by C. C. Minter, consulting chemist, who presented a paper on "Flame Movement and Pressure Development in Gasoline Engines." It was taken up in the discussion by R. N. Janeway, Chrysler Corporation engineering department, who disagreed with the assumptions made by Mr. Minter in his analysis, particularly insofar as Mr. Minter said that acceleration in the rate of pressure rise was of minor importance relative to the maximum rate of pressure rise in determining whether a chamber would be smooth or rough in operation.

Alex Taub, powerplant engineer, Chevrolet Motor Company, followed by disagreeing with both Mr. Janeway and Mr. Minter. The latter both followed analytical or mathematical methods in determining combustion chamber shapes, whereas Mr. Taub advocated a method involving comparative studies of different heads and trying to draw from empirical studies the characteristics of combustion chamber design best suited to a particular engine.

On the other hand, Mr. Taub agreed with Mr. Minter on that changes in compression ratio and b.m.e.p. had a vital effect on combustion chamber design and that findings on one chamber would not necessarily be applicable when any changes were made in these specifications.

In his discussion Mr. Taub showed slides and gave an explanation of the method pursued at the General Motors Proving Ground for investigations of combustion chambers. This method consists of making plaster casts of chambers, and then removing parts of the casting in steps by means of a tool which cuts spherically — to present flame front—with the center of the sphere located at the spark plug. By measuring the volume of the remaining part of the cast, rapid determination of volume burned to distance of flame travel is possible, as an important factor in analyzing whether or how much volume distribution was responsible for either smooth or rough combustion characteristics of a given head.

Mr. Taub said that these studies had shown that the central portion of the chamber—in relation to total distance of flame travel—was of the greatest importance in determining smoothness of combustion, with the first part of the chamber having a large influence on fuel economy and the last part on detonation characteristics. Mr. Taub said, in this respect, that an input of heat to the gases in the first part of the chamber results in materially reduced jacket loss, improving combustion efficiency and reducing radiator size required, and recommended the location of the exhaust valve in this part of the chamber. Mr. Taub also showed slides which indicated definitely that the assumption generally made in combustion chamber analyses (to the effect that the piston is standing still) is a sound one, since piston movement apparently has practically no influence on the volume burned to flame travel relationship.

The question of turbulence apparently is still anathema to Mr. Janeway, who said that "apparently the industry is still having a hard time to unsell itself" on the importance of this factor in combustion chamber design. If nothing else had done so, this statement alone would have been ample to recall memories of similar heated combustion chamber design arguments in S.A.E. meetings, particularly those in which Mr. Janeway and Mr. Taub sided against Dr. Whatmough a few years ago.

Bernard Lewis of the U. S. Bureau of Mines, in his discussion of the other paper at this session, "Engine flame temperatures vary with knock and with position in the combustion chamber," by G. M. Rassweiler and Lloyd Withrow, G. M. Research Laboratories (*Automotive Industries*, Jan. 19, page 86), supported the contention of the authors that turbulence of gases in the chamber produced by knocking combustion resulted in greater heat transfer to cylinder walls and was therefore responsible for the lower temperature of exhaust gases experienced with knocking as opposed to non-knocking combustion. The session chairman was F. F. Kishline, Graham-Paige. Others who contributed to the discussion of the two papers included Charles F. Marvin, Jr., and Frank R. Caldwell of the Bureau of Standards (written discussion), Guenther von Elbe of the Carnegie Institute and A. L. Herschey and R. F. Paton, University of Illinois (written discussion).

Selling Private Commercial Planes

A PAPER on "Sales and Technical Problems of Private Commercial Airplanes" was presented by Peter Altman, consulting engineer of the Stinson Aircraft Corporation and director of the Aeronautical Department of the University of Detroit. The paper dealt particularly with some of the more important sales and technical problems of private commercial four- to five-place airplanes of 50-60 hp. per passenger, although some of the statements made apply equally to other types. Among the problems discussed were the following: Monoplane vs. Biplane, the Single-Cabin Monoplane and Biplane, Sales Distribution, National Sales Distribution, Who Are the Private Owners?, Operating Records, Cost of Flying, Distribution of Operating Costs, Depreciation, Fuel Costs, Maintenance and Overhaul, Hangar Rent, Insurance, Interests, Technical Observations, Longitudinal Stability, Airplane Spins, Control Surfaces, Increasing Speed for a Given Power, Factors Contributing to Increase in Speed, Retracting or Fairing the Tail Wheel and Landing Gear, Flaps, Speed Arresters or Air Brakes, The Controllable-Pitch Propeller, and Airplane Structures.

JUST AMONG OURSELVES

Richberg Chides Industry's Leaders

INDIVIDUALISM in the automotive industry received some pointed pokes from Donald R. Richberg in his speech before the National Automobile Dealers Association. Particularly he chided the industry because sympathy with NRA "has not been clearly apparent among those most influential in the industry."

In spots the logic of the President's No. 1 man is somewhat hard to follow. He said "We have seen developing artificial efforts to stop natural production increases and price reductions. . . ." and again "This industry should be able to see clearly that it cannot grow and prosper if destructive competitive practice and monopolistic controls of prices, production and wages flourish in other industries."

Probably more than anything else whatever lack of enthusiasm for NRA there is among automobile manufacturers is due to their belief that it fostered regulations of price and production of the type Mr. Richberg criticizes.

* * *

Workers Share in the Profits

ANY profits earned by a well-known aircraft manufacturer in excess of a just return on investment are to be shared 50-50 between employees and stockholders under a collective agreement recently made with an organization of its employees. If definitions of "just return" and "investment" can be agreed on without too much argument, such contracts seem to have possibilities in certain directions.

Obviously if the workers share in profits, they won't be so ready to believe that profits are obtained by gouging labor, thus checkmating one of the stock arguments of some labor leaders who have been using the improvement in industrial profits in 1934 over 1933 as evidence that labor is not getting a proper share of the fruits of recovery.

* * *

Workers Elect Workers To Represent Workers

IN the proportional vs. majority representation battle, a fundamental issue is whether workers can bargain more effectively through representatives selected from their own ranks, or through professional walking delegates. Organized labor insists only the walking delegate can provide effective representation in bargaining since he is not in any way beholden to the employer and moreover that the workers can present their grievances and demands through him without subjecting themselves to individual persecution.

The other school of thought holds that due to the complexity of modern industry, the bargaining representatives must be intimately familiar with plant conditions and problems in order to carry on effectively, and that consequently representatives drawn from the ranks of the workers will get the best results. Persecution of such representatives because of their activities in behalf of their fellow-employees, it is contended, can be prevented by having labor boards to protect them against discrimination.

The viewpoint of organized labor on this issue was probably one of the important reasons why union leaders protested the ALB election rules so vigorously. They argued that under the rules the election would most likely result in the selection of a predominant number of worker representatives. The election did turn out that way at the Cadillac plant. But it appears more than probable that this result was due to the feeling of the workers that they could represent themselves better and possibly to the weakness of the unions at that plant, than to any quirks in the rules laid down by the ALB.

* * *

Equipment at Net Prices

THE dealer code requires that accessory equipment be sold at the manufacturer's list price. But, if the manufacturer does not establish any list price but sells the equipment to the dealer at a net figure, the dealer apparently may sell it for any figure he sees fit. If the interpretation some dealer code officials place on a bulletin issued recently by one car factory is correct, the possibilities of this situation have not been entirely overlooked.

* * *

O-O-h-H!

FROM a parody presented by Waring's Pennsylvanians at the Ford dealer introduction meetings:

It glides o'er the roads with the greatest of ease,
This handsome new car without any knees.

—*The Editors*

Industry's Role in the Security Plan

Unemployment Compensation

What employers are subject to the bill?

All employers, except governmental, who employ four or more persons within each 13 or more calendar weeks in the taxable year.

How are they affected?

They are subject to an annual Federal excise tax on their TOTAL payrolls of 3 per cent, except that if business continues subnormal as measured by the Federal Reserve Board index of industrial production, the tax may be 1 or 2 per cent in 1936 and 1937.

How is the tax paid?

It depends on whether or not the state in which the employer is situated has in effect an unemployment compensation law which the Secretary of Labor certifies meets the standards set by the bill.

What happens if the state does *not* have such a law?

The proceeds of the excise tax on payrolls goes into the general fund of the Federal treasury. This is expected to accelerate enactment of unemployment compensation laws by the several states.

What happens if the state *does* have such a law?

Then payments made by employers to state unemployment reserve funds may be credited against the Federal tax up to 90 per cent of the amount of that tax. The remaining 10 per cent or more is paid to the Federal government and is used to pay Federal and state administrative costs.

What standards must a state meet to get the approval of the Secretary of Labor?

It must accept the Wagner-Peyser Act providing for the establishment of public employment offices. Its unemployment compensation law must provide for the payment of all benefits through these offices and all contributions received by the state for unemployment insurance must be turned over to the unemployment trust fund, which fund the bill directs the Secretary of the Treasury to establish and administer. Moreover, none of the money drawn from this fund by a state may be used for any purpose other than the payment of benefits. An unemployed person shall not be denied compensation because he refuses to serve as a strike-breaker, because he refuses a job at subnormal wages or working conditions, or because he refuses a job conditioned on his joining a company union or which would interfere with his joining or belonging to a "bona fide" labor organization.

How will the Secretary of the Treasury handle money received from the states?

He will put it in the above-mentioned unemployment trust fund and may invest all or any part of it in primary obligations of the United States or in obligations guaranteed as to principal and interest by the United States. A separate book account is to be maintained for each state agency.

How do states get money out of the unemployment trust fund?

By requisitioning the Secretary of the Treasury for the amounts required up to the amounts held in trust for the particular state.

On what bases may contributions under state laws be handled?

The states have considerable latitude. It may pool all contributions in a single fund from which all eligible employees may draw benefits, or in addition it may segregate contributions of individual employers or groups of employers in separate accounts, from which benefits to their employees will be paid. However, when such separate accounts are exhausted, benefits may be paid from the pooled fund. States may also provide for guaranteed employment accounts by employers who desire to guarantee a minimum of 40 weeks annually at full wages.

Is there any special provision for employers who provide highly regular employment?

Yes. The state law may be written to permit such employers to contribute less than the standard amount because of their favorable employment record, the difference being accepted for credit against the Federal tax up to 90 per cent of that tax, just as though it had actually been contributed to the state fund.

Does the bill establish any rules for the payment of benefits?

No, this is left to the states. However, the President's Committee on Economic Security used a four-week waiting period in its calculations together with a 50 per cent compensation rate up to a maximum of $15 per week. The Committee says that with contributions of 3 per cent on payrolls, benefits should not be paid for more than 16 weeks and for not more than 15 weeks if it is desired to give workers who have been long employed an additional week of benefits up to 10 additional weeks for each six months they have been employed without drawing compensation.

Compulsory Contributory Old Age Annuities

(Old age pensions financed entirely by the government or by voluntary contributions by citizens are not covered herein, since they do not affect industry directly.)

What employers and employees are subject to the bill?

All, except government and railroad employers and employees, and non-manual workers receiving more than $250 monthly. During the first five years only employees under 60 years old are included.

How are they affected?

The earnings of all non-manual workers receiving $250 or less monthly are subject to the following annual Federal tax:

1937-1941 inclusive	1 per cent
1942-1946 "	2 per cent
1947-1951 "	3 per cent
1952-1956 "	4 per cent
1957 and thereafter	5 per cent

This tax is paid half by the employer and half by the employee. Provision is made for the payment of the tax by the sale of stamps by postmasters.

Who pays these taxes?

The employer, the employee's share being deducted from his pay.

What is done with these tax payments?

The money is segregated in an old age fund by the Secretary of the Treasury, who may invest it as in the case of the unemployment trust fund.

How will payments from the old age fund be made?

The Social Insurance Board, created by the bill, will requisition the funds needed to pay annuities.

What are the conditions under which annuities will be paid?

The individual must be not less than 65 years old; taxes must have been paid on his behalf prior to his sixtieth birthday; taxes must have been paid on his behalf for at least 200 weeks in not less than five years entirely prior to his 65th birthday; he must not be gainfully employed by another.

When will payments be made?

In monthly instalments beginning not earlier than 1942.

How much will be paid?

The instalments will be a percentage of the individual's average monthly wage during the period taxes were paid on his behalf except that such average wage to which the percentages are applied shall not exceed $150 monthly.

The instalments range from 15 per cent of average monthly wages for individuals on whose behalf taxes have been paid for 200 weeks in not less than five years up to a maximum of 40 per cent for 800 monthly tax payments in 20 years.

Persons on whose behalf tax payments begin after 1941, on retirement at age 65, will receive 10 per cent of average monthly earning plus 1 per cent for each 40 weeks or one year during which taxes have been paid.

Are wives protected?

Yes, optionally. An eligible person with a dependent wife may elect to take a joint and survivorship annuity of the same actuarial value as his individual annuity.

What happens in the event of death?

Taxes paid plus interest, less any annuities that may have been paid, are paid to dependents.

Fuel Injection May Displace on Army Single-Engined

ACCORDING to J. F. Campbell, Associate Mechanical Engineer, Power Plant Branch, U. S. Air Corps, it has been tentatively planned that all engines procured by the Air Corps after July 1, 1935, for single-engined airplanes will be equipped with fuel injection rather than carburetors.

This was revealed by Mr. Campbell in a highly interesting paper on "Fuel Injection as Applied to Aircraft Engines by the United States Army Air Corps," presented at the Aircraft Engine Session, S.A.E. annual meeting in Detroit last week.

Work was started on fuel injection in June, 1925, by the Army, the main objective being to increase the maneuverability of single-engined airplanes. Cooperating with M. G. Chandler, Marvel Carburetor Co., a fuel injection system has been developed since that time that has proven so satisfactory as to result in the above-mentioned tentative decision, and the removal, at this time, of fuel injection research work by the Air Corps from the secret list.

Although maneuverability was the prime objective in the substitution of fuel injection for carburetors by the Air Corps, there seems to be little doubt but that the decision may have been partially influenced by the fact, reported by Mr. Campbell, of marked simultaneous improvements in fuel economy and power output for the engines to which the system has been applied. Fuel consumptions of less than .38 lb. per hp. hr. were reported with the fuel injection equipment and power increases as high as 80 hp. per engine, although no attempt had been made to redesign superchargers for the handling of air alone.

Fuel used in most of the work was standard aviation gasoline of 87 octane. It was found, however, that with fuel injection it was possible to add 5 to 6 per cent of water to either alcohol or gasoline as a basic fuel without loss of power and with a net gain in decreased temperatures and tendency to knock. For "emergency" conditions including, perhaps, high-speed take-offs and rapid climbing, such a fuel would seem to have some definite advantages and opens up the possibility of providing two fuel types in army single-engined planes.

In the discussion, M. G. Chandler said that the development had proceeded now to a point where consideration might well be given to the adoption of fuel injection for engines designed for use in buses and trucks, etc., although he believed the cost might be somewhat too high to offer major possibilities at present for passenger cars.

Apparently the major problem faced in the development of a satisfactory fuel injection system was that of proper "phasing" of injection with intake impulses in the manifold. In this respect it would seem reasonable to assume that the incorporation of fuel injection on other engines requires even more engineering research and study for each type of power plant than in the case of carburetor equipped engines.

One point raised by Mr. Chandler in the discussion was the fear which many engineers have of bearing surfaces provided with no other lubrication than that inherent in the fuel itself. Mr. Campbell said, however, that they have had no case of seizure in almost 10 years of work, and no cases of bad surface wear in the past few years in spite of the fact that some of the sliding surfaces are rather heavily loaded and reach temperatures in operation too high to permit of their being touched with the bare hand.

J. H. Geisse, Department of Commerce, indicated in his comments on the paper that removal of this development from the army "secret" list and availability of the information to commercial airplane producers is highly opportune, recalling that numerous accidents are still occuring in commercial flying due to the formation of ice in the carburetors and manifolds of carburetor-equipped engines.

Some other interesting points mentioned by Mr. Campbell in his paper included the following:

Immediate efforts will be expended toward development of an automatic load and altitude control for fuel injectors, as exhaustive studies of all types of mechanical control systems indicate that it is practically impossible with such systems to fulfil all the requirements for highly supercharged engines which are now being installed in service airplanes.

Injectors developed are capable of 1000 hours of operation without replacement or change in performance—highly important in case of a national emergency.

In fuel injectors, the nozzle must be "dried" immediately after injection pressure surge subsides. There must be no pockets between the nozzle seat and the point where the fuel leaves the nozzle, to prevent condensation here of partially vaporized fuel.

In the Air Corps injection system the fuel is discharged in a conical sheaf against the air current in the manifold, the air reversing the flow of the fuel, aiding vaporization.

Nozzles employing spring-loaded valves were found to be unsatisfactory, since at some parts of the operating range the natural periods of the spring and assembly coincides with the pulsations of the fuel feed tube, causing fuel to discharge out of phase.

The increase in power output is attributed primarily to elimination of the pressure drop through the air heater, carburetor and hot spot. The smallest gain reported has been 8 per cent and the largest 15 per cent.

K. T. Keller, president of Dodge Bros., who was toastmaster at the S.A.E. annual meeting banquet in Detroit last week

Mica Spark Plugs

Another paper at this session dealt with the development of mica spark plugs having a higher heat range than any now commercially available. In-

Carburetors Airplanes

cluded in this paper were studies of cable failures at the point where they pass through the spark plug shield (radio shield?) due to electrical leakage and temperature build up. It was also pointed out that the temperature gradient from bottom to top of the plug must be increased, if the bottom of the plug is to be made sufficiently "hot" to prevent fouling and at the same time prevent too high a temperature at the top of the plug, to protect the cable and its insulation.

Others who participated in the discussion included H. K. Cummings, Bureau of Standards, who gave some details on two Italian installations for the high altitude testing of air-cooled and water-cooled engines in closed wind-tunnels, one at the Fiat and one at the Isotta-Fraschini plant; Earl A. Keeler, Chief Engineer, Defiance Spark Plug; Alan Ferrier, Canadian Air Service; A. H. Kipfer, American Air Lines, etc. Opie Chenoweth was the chairman at the session.

A summary of Mr. Campbell's paper follows:

The inherent unsatisfactory performance obtained with carburetors during the execution of tactical maneuvers prompted the starting of the development of mechanical metering by the Air Corps on June 10, 1925.

During the first part of 1934, an Air Corps specification was prepared covering the adaptation of a fuel injection system to the V-1710 type engine. This consisted mainly of a manifolding study and was accomplished at the Allison Engineering Company, in an effort to meet the requirements of this specification developed by the Air Corps of the U. S. Army.

Also, during the first part of this year, specifications for injectors suitable for 9-cylinder radial engines and 14-cylinder double row radial engines were prepared for the Eclipse Aviation Corporation. Injectors made to meet the requirements of these specifications have been fabricated and are now undergoing development tests. A specification for an injector for installation on a 9-cylinder radial engine has been prepared for the United American Bosch Corporation. This corporation is now working on designs and may at some subsequent date manufacture a device, in an effort to meet the requirements of this specification. All requirements for induction system fuel injection, as applied to present service engines and airplanes, are very definitely known at the Division at this time. Immediate efforts will be expended toward the development of an automatic load and altitude control for fuel injectors, as exhaustive studies of all types of mechanical control systems indicate that it is practically impossible with such systems to fulfill all the requirements for highly supercharged engines which are now being installed in service airplanes. Several sources of fuel injection systems are being developed in an effort to further the development of the system and reduce its cost. General specifications covering the requirements of the Air Corps for fuel injectors and for adapting fuel injectors and related equipment to aircraft engines have been prepared. General specifications covering discharge nozzles and a full automatic control are being prepared. It is hoped by the Division that many vendors will become interested in supplying items to meet these specifications so that development will proceed more rapidly.

1100 Hear Acoustics Discussed At S. A. E. Session for Students

FOLLOWING the tradition set by the student activity under the guidance of Alex Taub, the student session on Monday night drew an attendance of over 1100. What helped to swell the crowd was a demonstrative lecture on acoustics by H. R. Berlin of the Johns-Manville Corp., supplemented by a discussion of automotive problems of acoustics by J. H. Parkinson, another brilliant member of the acoustics laboratory of the company. O. E. Kurt of U. S. Rubber served as chairman and master of ceremonies at the meeting.

Berlin's talk dealt not only with the fundamentals of sound but also with the applications of these principles to structures such as auditoriums. Apart from the many pieces of apparatus that were demonstrated, an interesting feature of the presentation was a sound film which explained many of the phenomena in sound, described by the speaker.

Mr. Berlin was followed by J. H. Parkinson who talked specifically on the application of acoustical technique to problems of body and chassis silencing. Among other things the speaker showed curves demonstrating the reduction in noise level through the use of the correct type of deadening material. It was also interesting to learn that research has succeeded in developing special materials having a unique range of action within any desired band of frequencies. Thus these materials can function at their best at high, low, or intermediate frequencies as the case may be.

By means of phonograph records of sound within the car, Parkinson showed how the noise level was improved in an automobile by using a special type of sound deadening material developed some time ago by the laboratories.

CFR Aviation Fuel Tests Are Nearing Completion

A PROGRESS report of the CFR Aviation Gasoline Detonation Subcommittee was presented by Arthur Nutt of the Wright Aeronautical Corp. The objective of this Committee is to develop a standard method for the knock rating of aviation gasolines which will be applicable to all varieties of fuels and to all types of spark-ignition aircraft engines. The accepted ASTM-CFR method of rating motor fuels was adopted temporarily, and a program of cooperative engine tests was undertaken to ascertain whether or not octane number determinations by this method correlate with the behavior of widely different types of fuel in representative full-scale aircraft engines.

In carrying out the program of the subcommittee, tests have been made on Lycoming, Pratt & Whitney and Wright air engines. The program of test work has been about 85 per cent completed and it is hoped to complete it entirely by April 1 and present an analysis of the test results at the summer meeting.

Operators and Manufacturers Argue Truck Design

ONE of the most interesting papers presented at the S.A.E. annual meeting, from some standpoints, was that of F. L. Faulkner, Armour and Company, entitled "Motor Vehicle Design from the Operation and Maintenance Standpoint." Mr. Faulkner's paper was largely a comparative study of trucks in the same tonnage classifications, and as the result of this study he was able to point to numerous inconsistencies on the part of motor truck producers.

Perhaps of major interest were his references to inadequacy and inconsistency of electrical systems, particularly in the 14,000 to 16,000 lb. gross vehicle weight class. Some of his comments follow:

The major requirement for battery size is starting ability; if that is adequate, the battery generally is capable of taking care of any additional lighting loads to be placed upon it. Manufacturers also apparently select batteries on their capacity as fully charged, whereas in actual operation that only very rarely is the case, especially during winter operation. Adherence to an average battery size proportioned to engine displacement to minimize starting difficulties is recommended.

Undersize starting motors are frequently found, perhaps because of lack of adequate space provision in the truck design. "It is quite obvious," he said, "that manufacturers do not know the effort required to crank the engine at starting speed at zero degrees fahr., or we would not find so many variations in starting motors."

Mr. Faulkner believed, moreover, that many of the field difficulties laid to improper battery size or inadequate starting motor can be traced to the generator. On some trucks he found batteries capable of taking care of the imposed loads, but with generators on the same trucks absolutely incapable of keeping the battery charged, the same size generator being used in connection with a 140-amp. hr. battery as with an 80-amp. hr. unit.

In connection with ignition equipment, Mr. Faulkner's summarizing comment was a recommendation to truck manufacturers that they reduce the amount of money expended in "bright-metal" plating by an amount necessary to furnish adequate ignition systems.

Mr. Faulkner's studies also included comparative studies for different gross vehicle classifications of such items as piston displacement, clutch area, brake area, frame section modulus, front axle knuckle diameter, diameter of full floating rear axle tube, etc., with subsequent studies of each unit on the basis of cost per pound of gross vehicle weight and per pound of chassis weight. His point here was that in the selection of a truck of a given gross vehicle rating, the operator could effectively pick the more desirable unit by checking as to which vehicles had the greatest number of important maximum dimensions of the group studied.

He added, however, that in many cases encountered, probably due to desire for interchangeability of units, capacities of such items as clutches and brakes were actually higher than necessary. On brakes this applied particularly to the 8000 to 10,000-lb. class. On clutches, to the 14,000 to 16,000-lb. class. Frame section modulus per 1000 lb. of gross vehicle weight averaged rather low in the latter group, on the other hand.

In the discussion, Merle Horine, International Motor Company, objected to the judgment of individual truck merits on the basis of comparison with averages or maxima and minima for all trucks in the same tonnage classification.

B. B. Bachman, Autocar Company, felt that the application of this type of study had a tendency to "standardize" truck designs, and that you can't standardize on one truck design to fit all needs. In this, Pierre Schon, General Motors Truck Company, agreed with Mr. Bachman, saying that truck manufacturers should design their vehicles to meet individual requirements.

Somehow this seemed reminiscent of discussions on this subject a number of years ago, except that at that time the situation was reversed, with operators demanding special designs to fit their needs, and manufacturers holding out for standardization—the exact reverse of last week's discussion. Mr. Faulkner further emphasized that the objective of the study was largely to provide a measuring stick on which the comparative values of trucks on the market can be judged, and that for this purpose a comparative study of existing trucks provided the best possible means of solution.

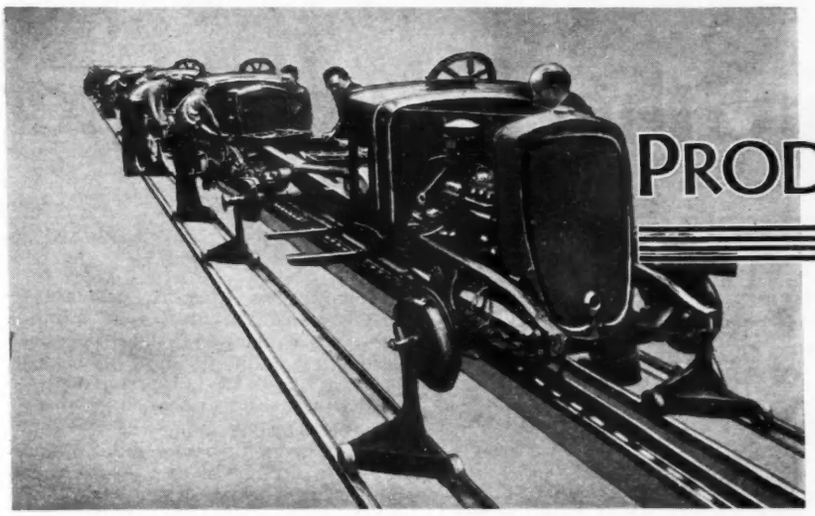
The session at which Mr. Faulkner presented his paper, with J. M. Orr as chairman, was virtually a continuation of a morning session devoted to transportation and maintenance also, and where the discussion on motor vehicle requirements had been initiated by a paper on "How to buy a truck" by T. L. Preble, Tide Water Oil Company.

Mr. Preble had pointed out in his paper the necessity for an automotive organization for a truck owner, which organization would be responsible for selection, retirement, and maintenance of motor trucks. This naturally gave rise to the question of how an operator who cannot maintain such an organization would or should select his equipment. Mr. Preble's idea on this point was that "unfortunately" the small operator is left to the mercy of the manufacturer. That he didn't think this very satisfactory was indicated by his comments regarding sales efforts by manufacturers. "We don't pay much attention to printed handbooks," he said, "and we find it best to go out and collect our own data on trucks."

The question of truck rating also came up again at this meeting, J. G. Moxie, Sun Oil Company, stating that his organization had found preferable to the S.A.E. formula one in which the displacement is multiplied by .7 to get the torque, and in which efficiency of drive units is considered as 90 per cent.

On the question of light versus heavy-duty trucks, Mr. Moxie expressed himself as of the belief that the latter were decidedly preferable and more economical for operations where outgoing loads encountered grades averaging, say, 3 per cent.

A paper on "How to Finish a Truck," by P. R. Croll and L. E. DuBey, Pittsburgh Plate Glass Company and Ditzler Color Company respectively, was also presented at the morning session. The authors recommended periodic stripping of trucks down to the metal for refinishing, so as to be able to remove all rust formations under the paint, irrespective of the type of finish on the truck.



PRODUCTION LINES

Jumpy Valves

That valves bounce is no secret—but how much and where is something else. Wilcox-Rich has the answer in an ingenious testing machine which they showed us in Detroit last week. It's a simple rig having a rotating shaft for the camshaft and a vertical mounting for the valve and valve lifter mechanism. The position of the cam is adjustable by means of a vernier and the exact reading of angular displacement is taken through an eyepiece illuminated by a neon tube. In similar fashion, the exact movement of the valve, i. e., displacement for any position of camshaft, is read off on a micrometer scale used in conjunction with another neon tube. At this point they have a housing with two shutters making a narrow slot, the light being seen just where the flag on the valve head cracks this slit. With this set-up, Wilcox-Rich has been able to trace valve troubles and show exactly why and where they occur. Incidentally, the automatic valve lifter shows up very creditably on this test.

Boss Ket

Luncheon was served to business paper editors at the New York Show by G. M., with "Ket" as the host. As a result we have culled some fresh epigrams out of the seemingly inexhaustible store of wisdom that sets C. F. Kettering apart. "The Diesel engine," said Kettering, "has been the most written about and the least seen. Cut-and-try is often the most direct approach to abstract science and the results generally agree. What we need now is a better knowledge of the behavior of engineering materials beyond their elastic limits, for few structures are designed to operate within the elastic limit under all conditions.

Diesel Autos

There is enough public interest in Diesel engine passenger cars to cause C. L. Cummins to consider the possibilities of their production on a moderate scale. Tentatively his idea is to convert gasoline engine cars to Diesel operation. He envisions six-cylinder engines with the bore ranging from 3½ to 3¾ in. and a stroke of 5 in., which would develop about 85 hp. at 2200 r.p.m. The car would weigh about 3800 lb. Incidentally there are now 35 service stations for Crummins' Diesels scattered over the country.

Round Treads

Round treads give better cornering power while flat treads should give better wear, K. D. Smith of Goodrich said in discussing the annual meeting paper presented by R. D. Evans of Goodyear. He added that it may become advisable to use different tires for front and rear, the former being designed to give a high degree of cornering power.

Fuel Burner

Continental has just announced a line of spark ignition engines which are manifolded to burn No. 1 fuel oil. They use the standard gasoline engine with special attachments for conversion to oil burners. You start on gasoline and run on oil. Economy is in proportion to the difference between the cost of ordinary fuel oil and gas station gasoline prices.

Free Coinage

Advertising and publicity men had a trying time this season turning neat phrases to describe the particular variety of features embodied in their line of cars. Thus we have an engine with "flying power," chasses that are centerpoised, bodies that are airstreamed or aerodynamic. If the pages of thermodynamics and general physics are opened to these men they can cull many happy phrases. As suggestions we throw in—isothermal and isochronic, centripetal and epicyclic, adiabatic and endothermic. It's a rich field for exploration.

Electric Irons

Capacity for producing electric furnace irons by Campbell, Wyant & Cannon has been greatly increased by a new electric furnace installation. The latest unit is a Lectromelt furnace of three tons per hour capacity on batch cold melting practice. When operating duplex this unit will handle from 12 to 15 tons per hour. This foundry now has five electric furnaces of the Lectromelt type—three of 1000 lb. per hr. capacity, one of 1½ tons per hr., and the new one of three tons per hr.

Electrically

Use of the electric furnace in steel making continues to grow. We learn that Duraloy, well-known makers of heat and corrosion resistant alloys, are installing their third Lectromelt furnace. This unit is rated at 500 pounds.—J. G.

MANUFACTURING MANAGEMENT METALLURGY

Problems in the Development

Part Two

Part One started on page 54 of the Jan. 12, 1935 issue of Automotive Industries

WITH good bores and good piston rings, the leakage of gas past the face of the ring is small—usually well below 1 cu. ft. per minute. This small amount of leakage, though undesirable, ordinarily does very little harm. Under certain conditions, however, piston rings collapse and leave the cylinder walls, whereupon the blowby becomes excessive. Such excessive blowby is responsible for loss in power, destruction of the oil film, rapid wear, and breakage of piston rings.

Ordinarily the lower compression ring is the first to fail when blowby is excessive. After one test made with rings of low radial pressure, the lower compression ring on every piston was broken and in not a single instance had the top ring failed. Evidence of ring collapse is furnished by a burned oil deposit on the face of the ring near the tip and by bright spots where the ends of the ring butt against each other. At the present time it is a common practice to shape piston rings to give a high radial pressure at the tips, and this has been effective in reducing blowby.

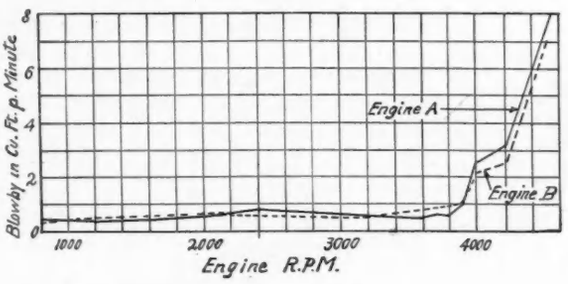


Fig. 9 — Rate of blowby of two different engines plotted against speed

The statement that the lower compression ring suffers most from blowby is based upon tests in which new rings are installed and the engine is then operated continuously under conditions of severe blowby. In normal operation it is the top ring which wears the most and which is most likely to lose tension because of high temperatures. Hence, when an engine which has been in service for a long time is operated under conditions of maximum blowby, it is likely to be the top ring which fails. In such a case the failure is not due to the fact that the force tending to collapse the ring is high but rather because the ring can offer but little resistance to this force.

Blowby curves for two engines of the same type are shown in Fig. 9. The similarity of these curves indicates that blowby is not primarily a question of smoothness of surface or nicety of fit. Fig. 10 furnishes rather convincing evidence that blowby is a maximum when there is a definite relation between the gas pressure and the inertia force. In this test, blowby was measured with various throttle openings at three different speeds. Results are plotted against i.m.e.p. which varies almost directly with gas pressure. At 3600 r.p.m. the blowby is a maximum when the i.m.e.p. is 85 lb. per sq. in. Since the inertia force varies as the square of the speed, it is possible to calculate for any other speed the i.m.e.p.

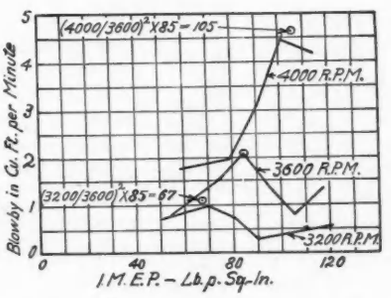


Fig. 10—Blowby plotted against m.e.p., for different speeds

(Indicating the blowby attains a maximum value for a given proportion between inertia force and mean effective pressure)

at which the relationship between i.m.e.p. and inertia would be the same as that which existed when the blowby at 3200 r.p.m. was a maximum. The figure shows that the calculated values are close to the points of maximum blowby.

Fig. 11 shows that a spring ring under the top compression ring reduced the blowby from 7 cu. ft. per minute to slightly over 1 cu. ft. per minute. This may be due to the ability of the inner ring to keep the top ring on the wall or to a reduction of the rocking of the piston. The latter effect was investigated by replacing the top compression ring with rings having flats filed on the surface so as to make them worthless as a seal. Even with these rings, the inner rings, by preventing rocking of the pistons, reduced the blowby at 4200 r.p.m. from 6 to less than one cu. ft. per minute. At 4500 r.p.m. the inner ring did not have sufficient strength to prevent rocking of the piston, and the lower blowby with the original installation was due to the spring ring's ability to prevent collapse of the top ring.

A recently developed compression ring (Fig. 12) is very effective in reducing blowby. Wear on the faces of this type of ring shows that, for a part of the stroke at least, the ring face is not parallel to the cylinder bore.

While engines differ with respect to their greed for oil, it is not uncommon to find the oil consumption increasing as the square of the speed. Hence doubling the speed is likely to cause a 300 per cent increase in oil consumption. This is not surprising, as the influence of several factors which affect oil consumption increases with the speed. In the first place, more oil is thrown on the cylinder walls at high speeds. Then, too, the "surf-board effect" or the tendency of the oil-control ring to ride over the film is dependent upon speed. Finally, the amount of oil actually burned on the cylinder walls depends upon combustion-chamber temperatures, and hence upon the amount of charge burned in the cylinder in unit time. The widespread use of oil-control rings with high unit pressures implies a recognition of the tendency of the ring to ride over the film at high speeds. That there is a loss due to the burning of the oil film is less generally understood. With the engine under discussion there was a marked reduction in oil consumption

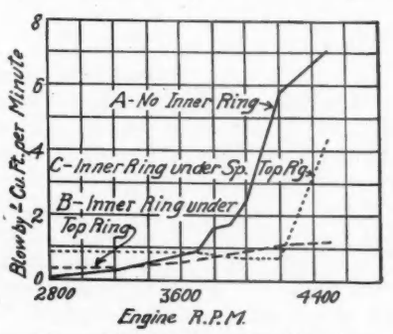


Fig. 11—Rates of blowby with different types of piston ring

# of a High-Speed Engine

by Stanwood W. Sparrow
Engineer, Research Dept.,
Studebaker Corporation

when operating at part throttle, and in a test in which the engine was motored at 4500 r.p.m. for 50 hours with closed throttle, the oil consumption was less than half as great as when it was operated at full load for the same length of time.

At the time the 8-250 went into production the oil consumption was not satisfactory. Baffles in the valve compartment gave considerable improvement at low speeds, and an inner ring used in conjunction with the oil ring helped the situation at high speeds. Nevertheless, the oil economy frequently fell short of the demands of a public which expects at least 500 miles per gallon at any speed and better than 1000 miles per gallon at speeds below 50 m.p.h. Relief came from an unexpected source, when it was discovered that oil mileages could be doubled by the removal of the top compression ring. There is room for argument as to why this change was effective. It can be stated positively, however, that the improvement was not due to an increase in blowby, as was first supposed. It has been demonstrated quite convincingly also that with the top ring removed, the piston land above what then becomes the top ring can be operated safely with very little radial clearance and that oil economy suffers if this clearance is increased. Presumably, then, the improvement in oil economy results from a reduction in the amount of cocking of the piston in the bore or in a reduction in the deflection of the piston at the ring belt.

With engines of high output there is considerable danger of cracks between the cylinder bore and the valve ports. Much of the mystery surrounding the cause of such cracks vanished when it was demonstrated that these cracks could be produced by a few minutes of preignition in engines which would operate indefinitely at full throttle with no sign of failure. This pointed to high temperatures as the cause of cracking, as it is well known that the temperatures during preignition may be more than 1000 deg. higher than under normal operation.

In order to judge the ability of any particular grade of iron to prevent cracking, it was necessary to be able to produce cracking at will in production cylinder blocks. This could be done by installing a "hot" spark plug in one cylinder of the engine and then operating the engine at full load at a speed of 3000 to 3500 r.p.m. The engine was operated for 10-minute periods after the drop in power indicated that the hot plug was preigniting. Spark plugs removed after such a test gave ample proof of the high temperatures prevailing during preignition. Occasionally several 10-minute periods were necessary to produce cracking, but usually one period was sufficient.

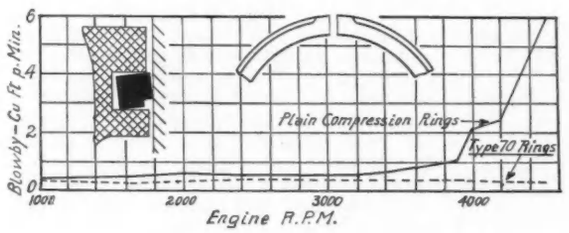


Fig. 12 — Rates of blowby with plain and special (Type 70) rings

Fig. 13 shows some locations of cracks obtained in a series of tests with different types of iron. It will be noted that the cracks occur at either the intake or exhaust port and may start at the bore or at the port. In one case there are three parallel cracks which are separated by less than 1/16 in. but do not meet. One starts at the bore, one at the port, and between these there is one which does not extend either to the bore or to the port. This group supports the belief that the cracks are surface failures and are not the result of any initial strain in the casting. Cracks are produced by high temperatures in a small area completely surrounded by metal at a much lower temperature. Further proof of this high temperature area was obtained by installing an aluminum plate between the cylinder head and block. The aluminum melted in the area where the cracks ordinarily appear, although a short distance away the metal was cool enough to permit the formation of carbon. It is reasonable to conclude that the metal in the high temperature area takes a permanent set when expansion is prevented by the relatively cool metal which surrounds it. The crack is a failure in tension and takes place when the metal cools.

To further illustrate this type of cracking, a piston was placed in water and the center of the head was heated with a torch. The head cracked as the piston cooled. Various methods of cooling and numerous types of cylinder-block iron were tested, and while it is unreasonable to believe that these did not affect resistance to cracking, nevertheless it was not possible to prevent the cracking of a block when subjected to repeated preignition tests. Fortunately, however, it is extremely difficult to produce preignition when an aluminum cylinder head is used.

Steels are available which are capable of withstanding the high temperatures to which exhaust valves are subjected even when the tappet clearance is inadequate and there is no opportunity for heat transfer between the valve and its seat. When a valve does burn it usually is due to a slight surface crack or to some other imperfection in manufacture. Grinding the valves under their heads to facilitate the detection of such flaws has proved to be a worth-while protection against burned valves. The pounding down of valve seats is also the result of high temperatures, and with the F.D. it frequently was necessary to adjust the tappet clearance during any 50 hour run at speeds above 3000 r.p.m. This trouble disappeared almost entirely when the valve stem diameter was increased from 5/16 to 11/32 in. and care was taken to obtain straight holes in the valve guides. If any one questions the importance of the valve stem as a medium of heat transfer, a test with valve stems undercut for a short distance will prove convincing. Such valves will burn under conditions which are by no means severe.

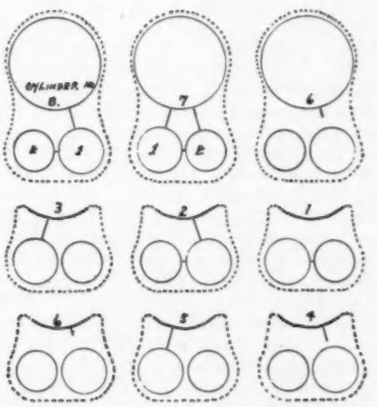


Fig. 13—Some locations of cracks between cylinder barrel and valve ports

Except in rare cases, where an inferior grade of fuel is used, valve stick-

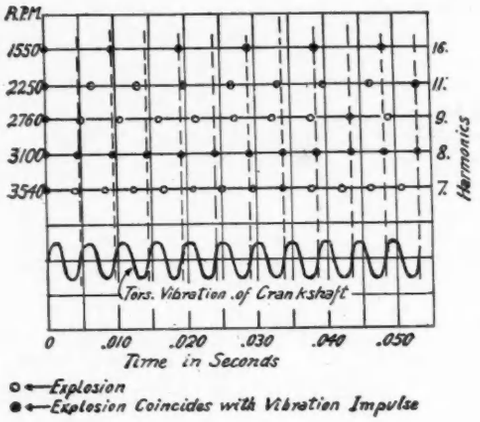


Fig. 14—Diagram of critical speeds of cranktrain assembly

(All circles represent explosions, those in black explosions synchronous with crankshaft free vibrations)

ing is confined to the exhaust valves. The sticking is due to a black enamel-like deposit which comes from the oil and is produced over a rather narrow range of temperatures. Such deposits are usually found under the heads of intake valves—where they do no particular harm—and on the stems of exhaust valves, where they are likely to prevent the valve from closing. As yet no satisfactory way to prevent the formation of such deposits has been found, but the sticking of the valves can be prevented by providing sufficient valve spring tension to shear off the deposit as it forms. In the event the tension necessary to prevent valve clatter is not sufficient for this purpose the same results can be obtained by slotting the guides to increase the unit pressure at the shearing edge.

Although considerable trouble was experienced in finding a valve spring which was satisfactory for the original engine, the only changes since that time have been an increase in tension to prevent valve clatter at the higher engine speeds, and the adoption of valve-spring dampers.

A piston may be defined as a hunk of metal essential to the operation of an internal combustion engine and created for the express purpose of preventing engineers from becoming conceited. It accomplishes its purpose by slapping or scoring whenever the piston problem appears to be solved. Although tin-plated cast-iron pistons have been used in a companion engine of shorter stroke, aluminum pistons have always been used in this engine, to prevent excessive bearing loads. Types of pistons have included the narrow strut, the wide strut, and the oval ground T-slot construction, and in general any one of these three types may be fitted to a clearance small enough to prevent slap and still operate at full load without scoring. When a piston does score it is usually because of the heat generated when a small portion of the surface breaks through the oil film, and it is not uncommon to find no evidence whatever of scoring on the opposite thrust face.

From the standpoint of the piston, the efforts to prevent scoring may seem woefully inadequate. In the interest of oil economy, oil control rings of high unit pressure are provided to scrape the oil from the cylinder walls as effectively as possible, and the film which remains is subjected to almost continuous flame. Under such conditions the piston is allowed one second in which to complete 75 round trips between top and bottom center and is expected to remain cool. Strangely enough, it usually succeeds.

In reality, the requirements for good oil economy are not inconsistent with those for good lubrication. A thin oil film usually means a cool oil film with the minimum amount of oil burned to carbon. To prevent metal-to-metal contact, however, smooth cylinder bores are essential. Three sets of rings were operated for 7 hours each in bores which until recently were considered entirely commercial. In the case of the group used during the first 7 hours, the tool marks were entirely worn away, and in addition there were numerous brown spots which indicate the passage of hot gases past the face of the rings. Rings used in the third test all showed the original tool marks. With properly finished cylinder bores the initial run should cause no more wear than occurred with the second set of rings.

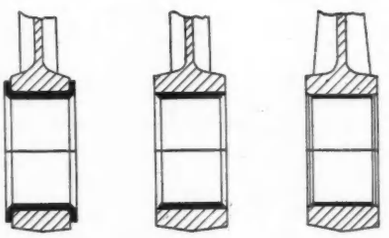


Fig. 15—Successive big-end bearing designs

Crankshaft failure is almost invariably the result of torsional vibration due to an inadequate vibration damper. In the absence of damping, the crankshaft used in this engine shows torsional periods at the speeds indicated in Fig. 14. The most violent period is found at 3100 r.p.m. The period at 2250 r.p.m. is not particularly severe, but with certain types of vibration dampers it has been more troublesome than the periods at 3100 and 1550 r.p.m.

With the conventional friction-plate damper originally used on this engine, in order to keep the magnitude of crank oscillations at a minimum, the pressure on the friction disks should be as high as possible without preventing slipping. However, with a setting high enough to give the best results at 3100 r.p.m., the damper would not slip sufficiently to provide satisfactory damping for the periods at lower speeds. In an automatic damper adopted to overcome this difficulty, the initial setting was low, and as the speed increased, centrifugal force acting on steel balls increased the load on the disks. This damper gave satisfactory control, except in a few cases where gum formed on the surface of the friction disks and caused sticking. The trouble from sticking has not been encountered with the oscillating type of damper in which motion of the damper flywheel is resisted by rubber bushings and the resistance increases with the deflection. The initial setting is determined by the amount the rubber is pressed into the tapered hole, and can be varied by means of shims. Any vibration which may originate in the damper itself is taken care of by the friction disk between the damper flywheel and the face of the fan pulley. At very high speeds the damper flywheel has shown some tendency to run out, and this has been corrected in the present design by means of a centering collar of fiber.

A stuck damper on this engine lowers the fundamental period of torsional vibration from 3100 to 2500 r.p.m. and introduces a period at 4000 r.p.m. with 5 oscillations in 2 revolutions.

Fatigue failures due to a lateral deflection have been responsible for the few cases in which a connecting rod has broken. A rod bent in a testing machine indicates the areas of maximum stress. To increase the factor of safety, the 8-250 rods have been "fattened" at the big end, and to reduce stress concentration a cylindrical instead of a flat surface is employed to keep the bolt from turning. In addition, the steel has been changed to give added fatigue resistance.

In the first experimental engines, main bearings 3, 5 and 7 received an undue amount of punishment in an endurance test at 3500 r.p.m. Before going into production, however, the shaft was counterweighted, and satisfactory bearing life was obtained.

Later thin-back bearings came into the picture and were of interest primarily because of low cost. The first tests were very disappointing. A test was then made with bearings which were made from production bearings by turning down the outer shell. These behaved the same as the thick-back production bearings, which showed that the thickness of the shell did not have a major influence on bearing life. Subsequently, changes were made in the thickness and analysis of the babbitt, and the performance was in every respect a good as with the bearings with thick shells. When the engine speeds began to be carried above 4200 r.p.m., the bearings again became a source of worry and the possibilities of copper-lead as a bearing material were investigated. In the first tests with this material wear on the crank was excessive and this was corrected by an increase in oil pressure.

Connecting-rod bearings have been of the three types shown in Fig. 15. The first rods had babbitt flanges on the sides and cracks in the bearing surface proper would frequently extend to these flanges and cause large pieces to fall out. This would permit the cracks in the remainder to spread and bearing failure would soon follow. Consider-

able improvement resulted from the elimination of the babbitt flanges, and a further improvement from the adoption of the copper-lead liners. There is plenty of opportunity for further improvement in engine bearings; nevertheless, the factor of safety against bearing failure is as high at 4500 r.p.m. as it was in the original F.D. at 3500 r.p.m. and a 50-hour full-load run at 4500 r.p.m. leaves the bearings in good condition.

In connection with the bearing tests, a considerable amount of information on lubrication was obtained with a test set-up which made it possible to measure the amount of oil supplied to the crankpins. These tests showed that under certain conditions at high engine speeds the amount of oil entering the main journals was not adequate for the lubrication of the rods. Methods which proved effective in increasing the amount of oil supplied to the crankpin included an increase in the length, width, or depth of the main bearing groove and an increase in the oil pressure. In view of the importance of oil pressure, Fig. 16 is of interest as showing the extent to which oil pressure may be affected by a change in the clearance of the main and connecting rod bearings. At an engine speed of 4500 r.p.m., the oil pump delivers in excess of 10 gal. per minute with a discharge pressure of 40 lb. per sq. in. At 3200 r.p.m. an increase of 0.003 in. in the diametral clearance of the main bearings dropped the pressure from 68 to 28 lb. per sq. in. and a similar increase in the clearance of the rod bearings produced approximately the same pressure drop. The effect of this change upon the main bearing leakage and upon the actual flow to the connecting rod bearings is shown in Fig. 17. Attention is directed to the curve showing the oil flow with excessive clearance in the rod bearings. The break in the curve at 3600 r.p.m. is another illustration of oil flow being limited by inability to get more oil into the crankshaft.

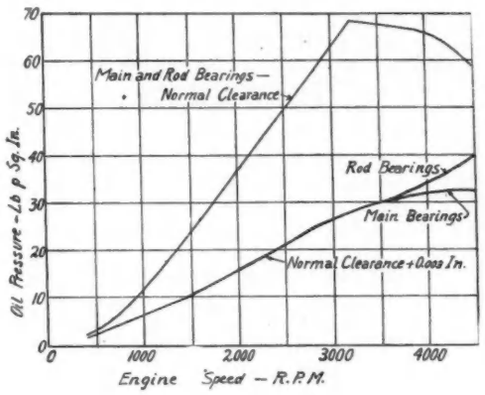

Oil Pressure - Lb. p. Sq. In.
Engine Speed — R.P.M.
Main and Rod Bearings — Normal Clearance
Rod Bearings
Main Bearings
Normal Clearance + 0.003 In.

Fig. 16—Oil-pressure as a function of engine speed for two different clearances in both main and connecting-rod bearings

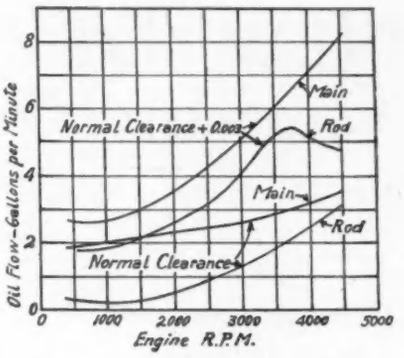


Fig. 17—End leakage from main bearings and oil flow to connecting-rod bearings as a function of engine speed for two different clearances of both sets of bearings.

(S.A.E. 20 oil; oil temperature, 180 deg.; main oil-line pressure, 40 lb. per sq. in.)

A Novel Sulfurized Cutting Fluid

A NOVEL sulfurized cutting fluid developed by the Thomas & Hochwalt Laboratories, Inc., Dayton, Ohio, called Sulflo, is now being produced commercially by the Sulflo Corp. of America, Princeton, N. J.

The use of Sulflo is said to permit metal cutting machines to be operated at higher speeds, greatly lengthen the life of tools, and give much better finishes to the products, especially those which are considered very difficult to machine.

Sulflo is an actual stable suspension of finely divided sulfur in petroleum oil or other liquid vehicles. It is different from sulfurized oils in that the sulfur is not a solution or chemical combination but exists in a suspended form. The Sulflo is a moderately thin, oily, yellow fluid, in which the sulfur particles are large enough to be seen with the unaided eye. It may be used in a squirt can, or circulated in the pump system of a lathe or automatic screw machine, and it is applied to the tool and work in the usual manner.

The action of Sulflo as a cutting fluid is unique and depends upon a peculiar property of sulfur not possessed by oils—namely, an increase in body or viscosity with a rise in temperature from its melting point of 235 deg. F. almost up to its boiling point of 832 deg. F. This high viscosity sulfur is carried by its suspending oil vehicle between the tool and the work, and then, at temperatures and pressures at which the oil thins and ceases to act as a lubricant, the viscous molten sulfur supplies a high degree of true fluid film lubrication, in addition to the usual chemical contamination film effects of sulfurized oils.

Sulflo is said to form and maintain true viscous films, and thereby decreases friction, heat, gouging, wear on the tool, and power consumption. By these features it increases tool life, benefits finish, permits higher speeds and feeds, machines to closer tolerances, and preserves machine tool bearings. Incidentally, Sulflo is odorless, aseptic, removes grime from clogged pores, and said to generally benefit skin condition.

In production shops, both spindle speeds and feeds have been stepped-up by the use of Sulflo on single and multiple spindle machines, and the number of pieces produced per hour is said to have been increased from 20 to 250 per cent. In these applications a very unusual fact has been observed—it is often essential to speed up the work to get the best results with Sulflo. The explanation of this is that sufficient local heat must be generated to melt the sulfur and make its high viscosity available for lubrication.

Sulflo, in addition to speeding production on normal materials, is particularly efficacious for difficult machining jobs, such as those involving chrome-vanadium and chrome-nickel steels, monel metal, "18-8" steel, and tough bronzes.

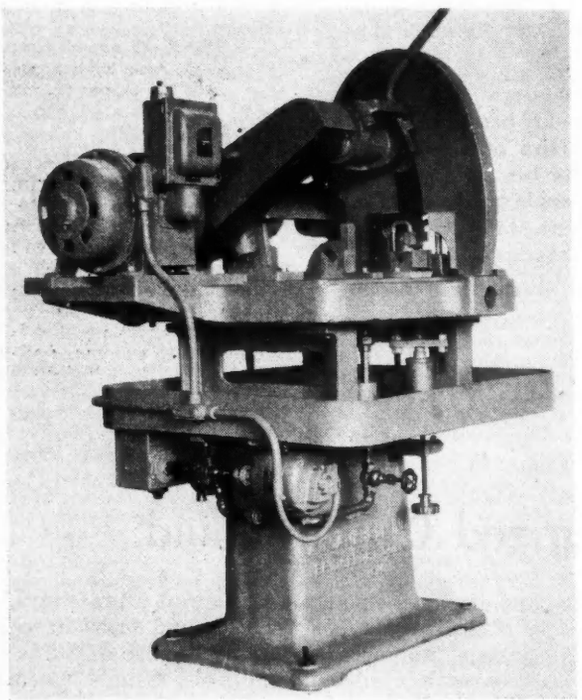
CIVIL and Government aircraft in the U. S. consumed more than 57,000,000 gallons of gasoline and nearly 2,000,000 gallons of oil during 1933, according to a survey by the Bureau of Air Commerce.

NEW DEVELOPMENTS
Automotive Parts, Accessories and Production Tools

Wet Abrasive Cutting Machines

Andrew C. Campbell division of the American Chain Co., Bridgeport, Conn., has developed a cutting machine in which the cutting disk is wetted with a liquid coolant. It is made in two models, No. 202 on which work clamp is operated by foot treadle, and model No. 203 which has an automatic electrically operated clamp. Both models have pedestal bases and all moving parts are protected, although easily accessible.

The disk by its own speed collects the proper amount of coolant and directs it against and into the cut being made. Continuous and uniform quantities of liquid are said to be assured, resulting in equal wear on both sides of the disk, longer disk life, elimination of burning or surface hardening, improved finish on cuts, and reduction in cutting costs. Cuts materials such as alloy steels, non-ferrous alloys, plastics and many other materials in solid bar up to 3 in. in diameter or tubing up to 3½-in. diameter.



Spotlight Lamp with Improved Beam Pattern

A new spotlight lamp, announced by the Westinghouse Lamp Company, Bloomfield, N. J., is self-focusing and has a new filament arrangement that produces a narrow vertical beam pattern of more even intensity than its predecessor.

In the new lamp the bayonet base of the former design is provided with a prefocusing collar like that introduced on automobile headlight lamps earlier this year. Three slots in the collar are so spaced that the lamp can be inserted in only one position in the reflector. This position is predetermined so as to produce the best focus for the beams of spotlights and auxiliary headlights.

An advantage of the new lamp is the shape of the beam spot, made possible by a change in the filament construction. The C-2 filament of the former lamp has been replaced by a C-6 design which gives a beam of more nearly uniform intensity.

The Hipkins Tractioneer

The Hipkins Tractioneer is a track-laying device which makes it possible to use trucks in places and for purposes where heretofore their use has been restricted for lack of road surface. This equipment is now being produced by the By-Products Steel Corp., a division of the Lukens Steel Co., Coatesville, Pa. Tests by the U. S. Army since 1929 have caused this equipment to be considered an integral part of its motorization program.

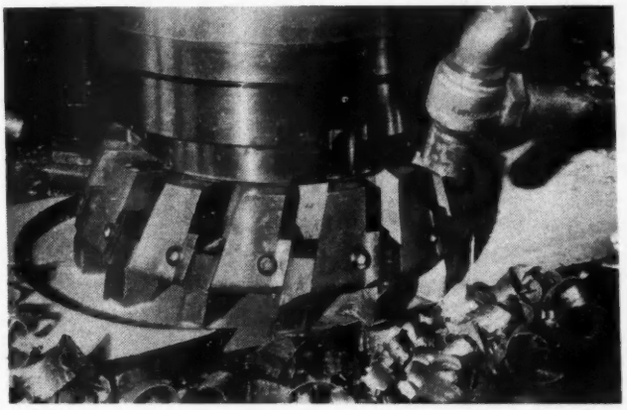
In one test a Ford truck loaded with 1¼ tons and drawing 3600 lb. negotiated an appreciable grade with deep loose sand as a road bed. In a mud test the truck was able to keep going with the same load when the spade of the 75-mm. gun was plowing an 8-in. furrow in the hard crown of the road due to the depth of the wheels in the mud. One Tractioneer-equipped truck climbed a 60 per cent grade without a load to give the rear wheels traction. Other tests have shown the ability of this equipment to make a truck perform in snow.

The equipment consists of pressed steel rectangular shoes connected to one another by flexible swivel type construction, permitting the shoe or shoes in contact with the ground to follow the contour of the footing. Mud cannot cake between the shoes, since the distance between them lessens as the shoes approach the ground and increases as they leave the ground. Perforations in the shoes help to prevent mud from caking inside. The shoe assembly is held on the wheel by a steel chain locked in much the same manner as a skid chain. As the wheels revolve, the shoes creep around the tire to prevent undue tire wear at any point, but the equipment is so built that the tires cannot spin inside the shoes.

Both four and six wheel trucks may be equipped with the Tractioneer. If the proper links and shoes are on hand the same unit can be made interchangeable for these two types of trucks. The double axle installation goes on caterpillar style.

Inserted Blade Milling Cutter

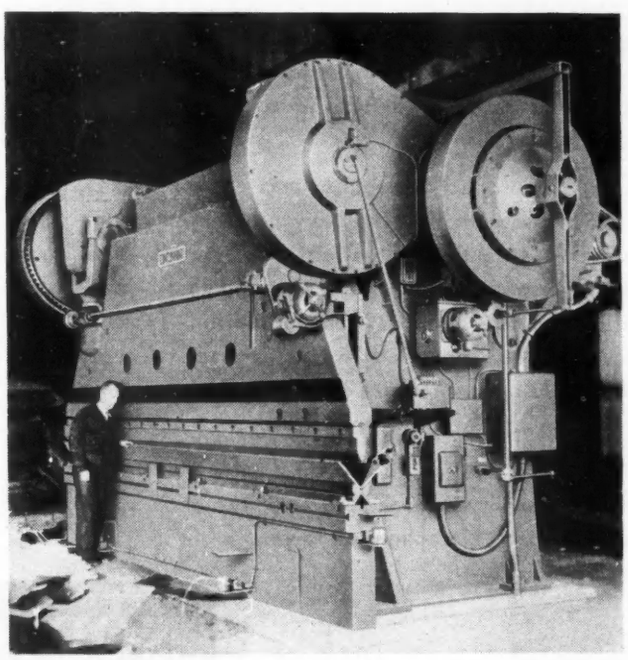
The type NB inserted blade face milling cutter is a recent addition to the line of small tools manufactured by the Ingersoll Milling Machine Company, Rockford, Ill. Although designed primarily as a general purpose cutter for heavy-duty milling, the type NB has several features that makes it particularly adaptable to the milling of steel.



The high-speed steel blades have a ¾-in. x 1¼-in. section; strong enough to stand the pressure developed and heavy enough to carry away the heat from the cutting edge when taking cuts up to ¾ in. deep. The blades project 1¼ in. beyond the face of the housing to provide adequate clearance for chips. Serrations on the back of the blades match with serrations in the housing to give additional holding area, so that the blades may be securely held at all times. The illustration shows an NB cutter taking a cut in SAE 1020 steel ¾ in. deep by 11 in wide at a feed of 4.32 in. per minute. There was no movement of the blades in the housing when taking this cut although 60 per cent of the blade had been used.

World's Largest Press Brake

Constructed to handle steel plates up to 1 in. in thickness in lengths up to 12 ft. and steel plates ¾ in. in thickness in lengths up to 18 ft., the largest machine of its type ever built for bending, flanging, forming and multiple punching has recently been completed by the Cincinati Shaper Co., Cincinnati, Ohio. The press brake has been installed in the By-Products division of Lukens Steel Company at Coatesville, Pa., and will enable Lukens to supply bent or formed plates in extremes of thickness and length as required by its customers as well as for use in the manufacture of the welded steel structures produced by the Lukenweld division for machinery and equipment manufacturers.



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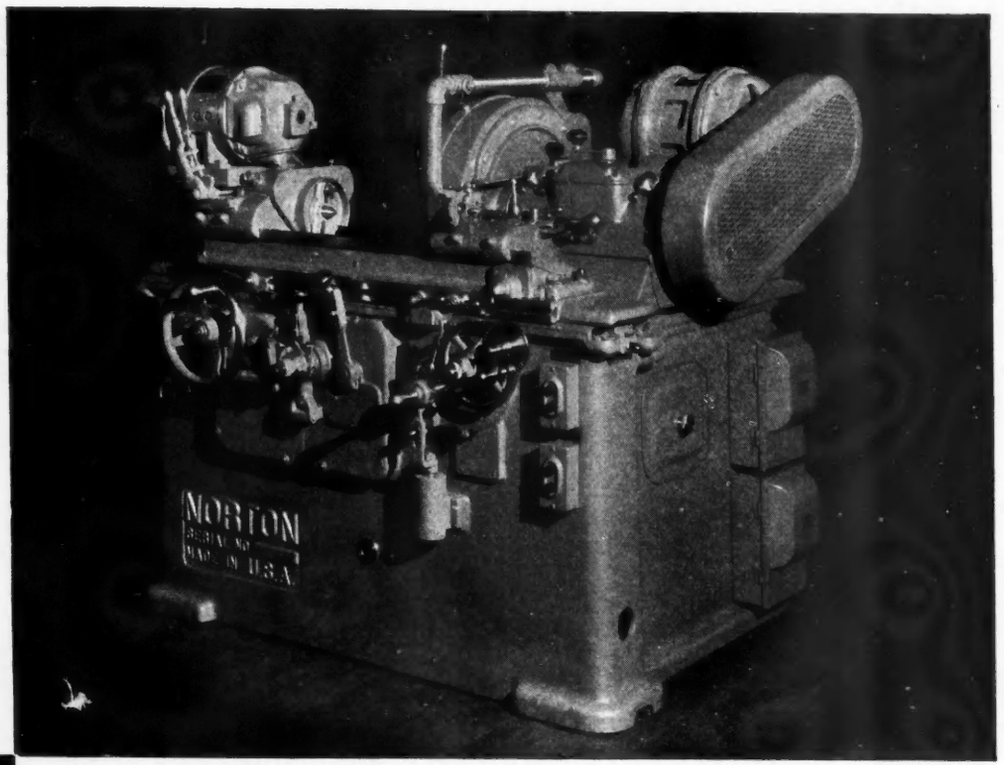

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The New Norton 6" Type C

THE newest addition to the popular Norton Type C line — a 6" size.

Hydraulic operation, large powerful wheel unit with 20" grinding wheel (same hole size as for larger machines), flood lubricated spindle bearings, large centers and forced-feed lubricated ways are features which make it a most desirable machine.

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